WORK PLAN – VOLUME 1
REVISION 3
TECHNICAL APPROACH

REMEDIAL INVESTIGATION / FEASIBILITY STUDY (RI/FS)
MANSFIELD TRAIL DUMP SITE
BYRAM TOWNSHIP, SUSSEX COUNTY, NJ

Prepared for
U.S. Environmental Protection Agency
Region 2
290 Broadway
New York, New York 10007

Contract No.	:	EP-W-II-043
Work Assignment No.	:	002-RICO-A238
Date Prepared	:	February 15, 2013
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1.0 INTRODUCTION

EES JV (EES) has prepared this Work Plan – Volume 1 Technical Approach for the U.S. Environmental Protection Agency (EPA) Region 2 under Work Assignment (WA) number 002-RICO-A238, Remedial Action Contract (RAC) 2 (contract EP-W-II-043). The WA form (WAF) and statement of work (SOW) were signed by the EPA contracting officer on June 13, 2012, and acknowledged by EES on June 14, 2012. EES participated in a scoping meeting with EPA on June 27, 2012, to discuss and clarify SOW task and subtask elements anticipated for WA002. EES also performed a site visit with the EPA on June 27, 2012. Based on discussions from the scoping meeting, the Mansfield Site visit, and between the EES project manager (PM) and EPA's remedial project manager (RPM), EPA provided EES with revised SOWs on June 28, 2012, and January 29, 2013, WA amendments 002 and 003, respectively.

This work plan's technical approach details EES's understanding of the tasks and subtasks that were agreed upon and documented in the following documents:

- EPA – amended June 28, 2012 and January 29, 2013 SOWs
- EPA – accepted September 28, 2012 EES' Response to Comments on the Draft Work Plan Letter
- EPA – clarifying emails from November 21 and 26, 2012
- EES – additional cost information provided in emails from December 7, 2012 and December 12, 2012.

This Work Plan – Volume 1 presents EES's revised technical approach within the period of performance (POP) of 36 months, from June 13, 2012, through June 13, 2015 Work Plan – Volume 2 contains associated assumptions for estimated costs and level-of-effort (LOE) hours to implement the scope of work as specified in this Work Plan – Volume 1.

This Work Plan – Volume 1 includes proposed activities to complete remedial investigation/feasibility study (RI/FS) activities (Tasks 1 through 16). However, it is possible that, once work begins and investigations yield data, not all described subtasks or portions of subtasks will be required or will need to be implemented to the extent that they have been presented in this work plan. This work assignment and work plan are dynamic, and EES anticipates working closely with EPA regarding presentation of findings and subsequent decision-making within the framework of the phased RI/FS approach, as outlined below.

1.1 PURPOSE

This WA involves conducting an RI/FS at the Mansfield Trail Dump (Mansfield) Site, which includes the site proper, referred to in the work plan as "Source Areas Investigation Area," as well as the adjacent residential, industrial, and recreational/natural areas (see Figure 1). These areas adjacent to the Source Areas Investigation Area include the immediate residential area where sampling by EPA and the New Jersey Department of Environmental Protection (NJDEP) has already occurred. This area, which is inclusive of the Brookwood and Ross Roads neighborhood, will be referred to as the "Residential Investigation Area" in this work plan. Additionally, as outlined in Figure 1, other outlying residential areas are denoted as "Potential Residential Investigation Areas."

This Work Plan – Volume 1 sets forth the framework and requirements for this effort. The RI/FS will investigate the nature and extent of contamination in soil, soil vapor, groundwater, sediment, surface water, and air; and the threat this contamination poses to human health and the environment. The RI/FS will generate sufficient data to allow selection of an approach for site remediation that eliminates,

reduces, or controls risks to human health and the environment posed by the site, and that supports a Record of Decision (ROD).

1.2 SITE DESCRIPTION

Mansfield Site consists of waste disposal areas within wooded, undeveloped parcels with groundwater contamination extending into an adjacent residential neighborhood. The Mansfield Site is located along a wooded ridge situated between County Road 605 and Brookwood Road, just beyond a closed rail overpass in Byram Township, Sussex County, in northwestern New Jersey. The Source Areas Investigation Area is bounded to the north, south, and west by upland woods, and to the east by a former rail line. The impacted residential area, the Residential Investigation Area, is located immediately northwest of the Source Areas Investigation Area.

The Source Areas Investigation Area consists of hilly terrain with the highest elevation along the peak of the ridge in the western area and a steep narrow valley along the eastern border. A public pedestrian and bicycle path originating at the end of Brookwood Road, to the north of the Source Areas Investigation Area, curves across the ridge and runs north-south on the eastern edge of the Source Areas Investigation Area towards the closed rail overpass. Access to the path, formerly part of the original Stanhope-Sparta Road, is controlled by a locked lift gate that limits vehicular access. Pedestrians use the pathway for recreational purposes and as a means to get from the residential neighborhood to the nearby high school south of the Source Areas Investigation Area. This paved path passes directly adjacent to some of the waste disposal areas and a steep trail that accesses the ridge and additional disposal areas. The path is unpaved along the southern portion of the Source Areas Investigation Area (EPA 2011). The Source Areas Investigation Area is bounded to the east by a steep narrow valley. An abandoned railroad bed and right-of-way (ROW) and a divided stream that flows north on both sides of the ROW are located on the valley floor. The stream flows to Lubbers Run and the Musconetcong River. Both Lubbers Run and the Musconetcong River are used for recreation, including fishing, boating, and hiking. Information obtained by the NJ Division of Fish and Wildlife indicates that portions of the Musconetcong River are fished for human consumption. Segments of the Musconetcong River downstream of the Mansfield Site are federally designated as a National Wild and Scenic River.

In the wooded area of the Source Areas Investigation Area, there are five discrete areas of concern (AOCs) that were designated as Dump Areas A, B, C, D, and E (see Figure 2). As of May 2012, Dump Areas A, B, D, and E have been excavated to bedrock in a removal action (EPA 2012a). Dump Areas A, B, and D consisted of one or more trenches into which waste material (resembling sludge) of unknown origin had been deposited. Dump Area C consists of a disturbed area adjacent to Dump Area B. Dump Area E consisted of four parallel mounds in a wooded area between Dump Areas B and D. The public pedestrian and bicycle path described above runs north-south along the east side of Dump Areas C, D, and E. There is currently no fencing or other measure present that could prevent access to the Source Areas Investigation Area by the public, and trespassers have been observed using a network of wooded trails near Dump Area B for off-road motorcycles. Historical aerial photographs indicate that site operation began in the late 1950s and continued through the early 1970s (EPA 2010).

The Mansfield Site hydrogeology is characterized by a glacial overburden (till) aquifer hydraulically connected to the underlying bedrock (gneiss) aquifer. This vertical migration of groundwater between the two aquifers is supported by the presence of trichloroethene (TCE), likely from Dump Area A, to the nearby, topographically lower, bedrock residential wells at concentrations significantly above background. Based on available information at this time, it is believed that the ridge in the Source Areas Investigation Area forms a local groundwater divide, with the shallow groundwater to the west of the ridge flowing to the west-northwest and the shallow groundwater to the east of the ridge flowing to the

north. Groundwater flow in the bedrock is influenced by a complex system of local and regional faults, fractures, and joints, and localized pumping of private wells in the area.

1.3 SITE HISTORY

The groundwater contamination at Mansfield was discovered in 2004, when the Sussex County Health Department and the NJDEP sampled approximately 75 private wells in the area. The results revealed 18 wells in the Brookwood and Ross Roads neighborhood with TCE above the State of New Jersey drinking water standard of 1 microgram per liter (µg/L). The maximum TCE concentration in the residential wells was 110 µg/L. The NJDEP installed point-of-entry treatment systems (POETs) in 17 of the residences in 2005.

From 2006 to 2008, NJDEP collected indoor air and sub-slab soil gas samples from homes throughout the affected neighborhood. The results varied, with some homes showing TCE concentrations above State screening levels in just the sub-slab samples and some homes showing TCE concentrations above screening levels in both the sub-slab and indoor air samples. NJDEP installed sub-slab depressurization systems in five of the affected homes.

The waste disposal trenches at the Source Areas Investigation Area were first identified in 2009 by the NJDEP during an effort to identify the source of the TCE contamination detected in the nearby residential wells in the Brookwood and Ross Roads neighborhood. Subsequent reconnaissance efforts conducted by NJDEP, EPA, and its contractors in December 2009 and May 2010 indicated the following:

- Dump Area A consists of two trenches located on a ridgeline that trends southwest to northeast, directly upslope of and overlooking the Brookwood and Ross Roads neighborhood to the west. The upper trench and lower trench are approximately 120 feet long and 10 feet wide, with original excavated depths ranging from 3 to 5 feet.
- Dump Area B consists of a trench/low-lying area that is approximately 132 feet long and 15 feet wide and bermed on 3 sides.
- Dump Area C consists of an open, roughly circular patch of disturbed vegetation approximately 140 feet in diameter adjacent to Dump Area B.
- Dump Area D was first thought to consist of a single trench approximately 60 feet long and 20 feet wide. However, a subsequent review of historical aerial photos and additional reconnaissance efforts in May 2010 indicated that Dump Area D consists of four trenches (designated as Trench Nos. 1-4), with the original location an extension of Trench No. 1.
- Dump Area E (between Dump Areas B and D), first observed during the May 2010 reconnaissance, was found to consist of four parallel mounds, which are likely to be small berms surrounding three trenches.

In May 2009, NJDEP installed two monitoring wells between Dump Areas B and D (see Figure 2). The monitoring wells, MW-1 and MW-2, were both completed in the underlying fractured bedrock aquifer to a depth of 100 feet below grade. In July and October 2009, NJDEP collected samples from these wells using passive diffusion bags at various depths throughout the water column. Total concentrations of TCE, 1,2-dichloroethylene (1,2-DCE), and vinyl chloride in MW-1 ranged from 1.61 parts per billion (ppb) to 9.48 ppb; concentrations in MW-2 ranged from 771 ppb to 835 ppb.

In September 2009, NJDEP collected soil samples from Dump Areas A, B, and D. Analytical results indicated the presence of TCE in Dump Area A at a concentration over 20,000 parts per million (ppm). Soil from Dump Area B was found to contain benzene, ethylbenzene, toluene, and xylene (BTEX)

compounds, as well as various chlorinated benzene compounds. TCE, cis-1,2-dichloroethylene (cis-1,2-DCE), and chlorinated benzene compounds were detected in soil from Dump Area D.

EPA collected solid source (soil and waste), groundwater (on-site monitoring wells), and residential well samples between February and May 2010. Sample analytical results of waste samples collected from Dump Area A in April 2010 and residential well samples collected from private wells serving homes in the Brookwood and Ross Roads neighborhood in February and March 2010 document an observed release of TCE from the site and actual contamination of 15 residential wells serving 56 residents. In April 2010, a background monitoring well (MW-3) south of NJDEP monitoring wells MW-1 and MW-2 was installed (see Figure 2). Sampling of the on-site monitoring wells indicated the presence of TCE and other VOCs in the two NJDEP monitoring wells at concentrations significantly above background concentrations. Based on preliminary surficial groundwater flow maps, it appears that these monitoring wells are located on opposite sides of a surficial groundwater divide; however, throughout the remedial investigation, the actual potentiometric surfaces and flow pathways will be further assessed.

From May 10 through 19 and June 7 through 16, 2010, soil, groundwater, and composite waste samples were collected from test borings advanced throughout the Source Areas Investigation Area. Analytical results of soil and waste samples collected during the waste-source delineation phase indicated the presence of VOCs, such as TCE, 1,2-DCE, and various chlorinated compounds throughout the Source Areas Investigation Area. Polychlorinated biphenyls (PCBs) were detected in composite samples collected from Dump Areas A, B, and D. The extent of contamination has not been established horizontally or vertically.

The Mansfield Site was scored using the Hazard Ranking System in October 2010 and listed on the National Priorities List in March 2011.

In December 2011, EPA completed the Administrative Record for the time-critical removal action for the Mansfield Site. EPA authorized the mobilization of support equipment by their Emergency Response and Removal Service (ERRS) contractor to excavate contaminated soils from Dump Areas A, B, D, and E. Between March and May 2012, non-hazardous and hazardous soils from these Dump Areas were transported and disposed of at various EPA-approved landfills (EPA 2012a).

1.4 GENERAL REQUIREMENTS

EES will furnish necessary and appropriate personnel, materials, and services needed for, or incidental to, performing the RI/FS as specified in EES's SOW. Work will be managed and completed in accordance with the general requirements specified in the SOW. If EPA issues an amendment to the SOW, EES will submit a revised work plan and cost estimate for EPA review and approval.

EES will document how the RI/FS will be implemented in order to provide the information necessary to develop a well-supported ROD that, when implemented through a remedial action, will eliminate, reduce, or control risks to human health and the environment. In conducting this WA, EES will propose appropriate and cost-effective procedures and methodologies using accepted engineering practices and controls. EES will be responsible for performing services and providing products at a reasonable cost.

EES will maintain technical and financial records for the RI/FS in accordance with the contract. EES will submit documents and deliverables using electronic media whenever possible. At the completion of the WA, EES will submit an official record of the RI/FS to the RPM in both compact disc and hard-copy formats (see Task 16).

EES will incorporate EPA's Green Site Assessment and Remediation Guidelines into both administrative and technical aspects of the project. From an administrative standpoint, EES will write subcontracts that require adherence to Region 2's "Clean and Green" Policy and suggest that subcontractors consider green remediation best practices. Subcontract agreements and project reports will be prepared and submitted electronically rather than in hard copy format, when possible. Teleconferences or video conferences will be utilized as a means of communication when travel is not essential to the successful implementation of the project. Remedial alternative evaluations will encourage the reuse or recycling of on-site materials where practical and incorporate a renewable energy component when active treatment is recommended.

EES will utilize EPA Region 2's Green Site Assessment and Remediation Checklist to minimize adverse impacts to the environment, maximize the efficiency of energy and natural resource use, minimize or eliminate pollution, and reduce waste to the greatest extent possible. EES will accomplish these objectives by taking measures such as

- utilizing erosion controls to minimize runoff into environmentally sensitive areas,
- using fuel-efficient vehicles and equipment during field investigations,
- instituting idling restrictions for vehicles or other equipment utilized during the site investigation,
- utilizing non-invasive screening technologies to minimize the generation of wastes (such as geophysical surveys instead of test pitting),
- incorporating TRIAD methods to encourage systematic planning and dynamic work strategies, and
- implementing real-time measurement systems, when possible,

into the work plan. These and other recommended practices included on the checklist will be utilized as standard practice to support EPA's strategic plan for environmental stewardship.

EES will communicate at least monthly with the EPA RPM, either in face-to-face meetings or via teleconferences. The EPA and EES contacts for this WA are listed below.

EPA Primary Contact: Ms. Kristin Giacalone, EPA Region 2 RPM, (212) 637-4407; e-mail at giacalone.kristin@epa.gov; mailing address: EPA Region 2, 290 Broadway; New York, New York 10007

EPA Secondary Contact: Ms. Abbey States, EPA Region 2 Deputy Project Officer, (212) 637-4350; email at states.abbey@epa.gov ; mailing address: EPA Region 2, 290 Broadway; New York, New York 10007

EES Project Manager: Dr. Jennifer Knoepfle, (312) 443-0550 ext. 21; facsimile (312) 443-0557; e-mail at jknoepfle@onesullivan.com; mailing address: EES JV, 125 S. Wacker Drive, Suite 220, Chicago, IL 60606

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2.0 PROJECT APPROACH

The EPA SOW identifies the following 16 tasks under this WA:

Task 1 — Project Planning and Support
Task 2 — Community Involvement
Task 3 — Field Investigation
Task 4 — Sample Analysis
Task 5 — Analytical Support and Data Validation
Task 6 — Data Evaluation
Task 7 — Assessment of Risk
Task 8 — Treatability Study/Pilot Testing – Not Applicable
Task 9 — Remedial Investigation Report
Task 10 — Remedial Alternatives Screening
Task 11 — Remedial Alternatives Evaluation
Task 12 — Feasibility Study Report
Task 13 — Post RI/FS Support
Task 14 — Negotiation Support – Not Applicable
Task 15 — Administrative Record – Not Applicable
Task 16 — Work Assignment Closeout

This Work Plan – Volume 1 addresses activities associated with Tasks 1 through 16.

As discussed during the scoping meeting, EES anticipates that Task 3 – Field Investigation, as specified in EPA's SOW, will involve two phases of field work, referred to in this work plan as **Phase I** and **Phase II**. EES assumes that Phase I activities will occur during the summer of 2013 and Phase II activities during 2014. This work plan includes descriptions and assumptions for both phases of field work, based on the current understanding of site conditions. However, the exact number, types, and locations of samples that will be collected in the Phase II field investigation will be decided in part based on the results of Phase I. For this reason, upon completion of Task 6 – Data Evaluation activities related to Phase I data collection, EES will meet with EPA to confirm the remaining data collection activities. EES will prepare and submit a Quality Assurance Project Plan (QAPP) Addendum revising the proposed numbers, locations, analyses, and types of samples for Phase II field activities, after acceptance of the final Phase I Data Evaluation Summary Report (DESR) (see Task 6). EES's approved site-specific planning documents will govern project data collection methods for the remainder of the RI/FS.

It is reiterated that, because the proposed approach for the Mansfield Site requires two phases of work, notably for the field investigation (Task 3), it also affects other related elements of the project (Tasks 1, 4, 5, 6, 7, and 9). Because there is uncertainty regarding Phase II efforts, EES has made limiting assumptions based on RI/FS experience and familiarity with similar site aspects to craft a detailed work scope (Work Plan – Volume 1) with associated costs (Work Plan – Volume 2). EES intends to keep EPA apprised of progress and activities as the work proceeds in both Phase I and Phase II.

The following subsections describe EES's technical approach for completing the activities required under each applicable task and subtask. Work Plan - Volume 2 presents EES's estimates of the LOE hours required to perform each task and subtask, as well as associated assumptions used in estimating LOE hours and costs.

TASK 1 — PROJECT PLANNING AND SUPPORT

This work element involves planning the execution and overall management of the WA. EES will maintain technical and financial records for this WA in accordance with the contract. EES will submit documents using electronic media whenever possible and hard copies if requested by EPA.

In accordance with the RAC 2 contract, non site-specific program management activities will be supported by a 6.4 percent charge to the total cost of the WA.

Subtask 1.1 — Project Planning and Support

EES will provide project administration and management support in the performance of this WA. The period of performance for this WA is the 36-month period from June 13, 2012, through June 13, 2015. Project administration will include:

- Preparation of technical monthly report – EES will prepare monthly progress reports in accordance with the requirements under the RAC 2 contract. EES will manage and track costs and submit invoices by LOE (P-level) for the reporting period as well as cumulative amounts expended to date. EES will accommodate any external audit or review mechanism and will attend EPA-held training as directed by EPA, but has not included hours for such activities in this cost estimate
- Review of weekly financial report
- Review and update schedule
- Weekly communication with EPA RPM

Program support personnel activities under project administration will also include:

- Review of the WA technical/financial status reports for the monthly progress report
- Technical resource management
- Review of WA budget
- Respond to questions from the EPA PO and CO

Subtask 1.2 — Scoping Meeting

EES contacted the EPA RPM and Project Officer (PO) within five calendar days after receiving the WA to schedule the scoping meeting, which was held on June 27, 2012. Three EES personnel attended the scoping meeting with EPA, which was conducted over a 3-hour period. EES personnel each had 2 hours of preparation time for the meeting and 4 hours of round-trip travel time to EPA offices in New York City. EES prepared and delivered the scoping meeting minutes on July 2, 2012.

Subtask 1.3 — Conduct Site Visit

EES personnel visited the Mansfield Site in the afternoon of June 27, 2012, with the EPA RPM, Kristin Giacalone; the EPA Human Health (HH) Risk Assessor, Rebecca Ofrane; the EPA Hydrogeologist, Katie Mishkin; and an EPA intern, Nick Mazziota.

Subtask 1.4 — Develop Draft Work Plan and Associated Cost Estimate

EES has prepared this RI/FS work plan that includes the following elements:

- A description of individual tasks to be performed and EES's proposed technical approach to each task, including assumptions and a description of the work products that will be submitted to EPA.

Subtask 1.5 — Negotiate and Revise Draft Work Plan/Budget

EES personnel participated in one work plan fact-finding meeting with EPA via teleconference, on September 19, 2012. EES prepared a Response to Comment (RTC) letter in response to the fact-finding meeting concerning the EPA comment letter (September 2012). Based on post-RTC letter discussions with EPA, EES also revised the Draft Work Plan into two volumes, technical approach (Volume 1) and cost estimate (Volume 2). These two volumes incorporate modifications and suggested changes as outlined in the revised SOWs and EPA correspondences. Since submission of the Draft Work Plan in July 2012, there have been three revisions of this Work Plan – Volume 1 (including this February 2013 submission), and the first revision of Work Plan – Volume 2.

EES also anticipates participating in one negotiation meeting to discuss the revised cost estimates in Work Plan – Volume 2 revision 1.

Subtask 1.6 — Evaluate Existing Data and Documents

EES has received numerous site documents from the EPA RPM and the NJDEP site representative and has also acquired various site-relevant electronic documents from the Internet. EES has commenced the cataloging and reviewing of background documents, which include EPA and NJDEP reports and data packages. Specifically, EES has acquired the *Mansfield Trail Dump Hazard Ranking System (HRS) Documentation Record* (with 40 additional references), *Mansfield Trail Dump Integrated Assessment* (with 69 additional references), *EPA Removal Site Evaluation Reports, EPA Pollution Reports, EPA Aerial Photographic Analysis, recent NJDEP residential data results, monitoring well logs, EPA ERT Vapor Intrusion (VI) field work reports and data packages*, as well as *area topographic and geologic maps.* EES assumes the PM and/or one additional staff member will review each of the relevant background documents and create summaries. The historical data and document review summary will be used to refine the field approach and develop the conceptual site model (CSM), both of which will be incorporated into the site-specific QAPP.

Subtask 1.7 — Quality Assurance Project Plan

EES will prepare a QAPP in accordance with the *Intergovernmental Data Quality Task Force Uniform Federal Policy (UFP) for Quality Assurance Project Plans*, EPA-505-B-04-900A, March 2005b. The UFP-QAPP meets the requirements of *EPA Requirements for Quality Assurance Project Plans (*QA/R-5) EPA/24/B-01/003, March 2001 (reissued May 2006) (EPA 2006a). The QAPP describes policy, organization, and functional activities, and the data quality objectives (DQO); it also establishes objectives necessary to achieve adequate data for use in planning and documenting the sampling investigation. EES will submit the site-specific QAPP as an appendix to the WA work plan according to the SOW deliverables matrix.

As discussed during the June 27, 2012 scoping meeting, in order to keep the project moving forward and to begin Phase I field investigations during the 2012 calendar year, EPA may consider additional interim funding for EES to begin the QAPP prior to final Work Plan - Volume 1 and - Volume 2 approval.

Subtask 1.8 — Health and Safety Plan

EES will prepare a site-specific health and safety plan (HASP). The HASP specifies employee training, personal protective equipment (PPE), medical surveillance requirements, standard operating procedures, and a contingency plan in accordance with 29 *Code of Federal Regulations* (CFR) 1910.120(l)(1) and (l)(2). The HASP will be internally reviewed by an EES Certified Industrial Hygienist (CIH) before

submittal to EPA. EES will submit the HASP as an appendix to the WA work plan according to the deliverables matrix schedule (Table 1 of the SOW).

As discussed during the June 27, 2012 scoping meeting, in order to keep the project moving forward and attempt to begin Phase I field investigations this calendar year, EPA may consider interim funding for EES to begin the HASP prior to final work plan approval.

Subtask 1.9 — Non-Routine Analytical Services

At the request of EPA, EES will develop an EPA-approved laboratory QA program that provides oversight of in-house and subcontracted laboratories through periodic performance evaluation sample analyses and/or on-site audits of operations, and prescribes a system of corrective actions to be implemented in cases where the laboratory's performance does not meet the standards of this program. This will include, at a minimum:

- Prepare Laboratory Services Requests (e.g., statements of work) for non-routine analytical services (non-RAS) parameters for Phase I and Phase II sampling efforts. The Laboratory Services Request(s) will include the following elements:
    - digestion/analytical methods
    - data deliverable requirements
    - QC requirements
    - estimated number of samples
    - method restrictions and penalties for non-compliance
    - turn-around times
- Develop QC criteria for each parameter of the approved site-specific or contract-wide QAPP that will be incorporated into the Laboratory Service Request.
- EES will comply with applicable and appropriate requirements in the acquisition and management of subcontracts for analytical services, including the requirements, terms, and conditions of this contract; the subcontractor's corporate standard operating procedures; and the applicable requirements of the Federal Acquisition Regulation (FAR), Environmental Protection Agency Acquisition Regulation (EPA AR), and other relevant Federal and Agency acquisition requirements.
- At the request of the EPA RPM, EES will submit the Laboratory Services Request for EPA review prior to solicitation of an analytical services subcontract.
- EES has assumed that no laboratory audits will be performed and that National Environmental Laboratory Accreditation Program (NELAP) certification will be sufficient.

Subtask 1.10 — Meetings

EES will participate in progress meetings and/or conference calls during the course of the WA, as detailed in the SOW. As specified in the SOW, EES will assume six meetings, with three people in attendance at each. EES will also prepare minutes for each meeting.

Subtask 1.11 — Subcontractor Procurement

EES will identify, procure, and administer the necessary subcontracts. As specified in the SOW, EES anticipates that the following subcontractors will be required to execute the SOW identified in this work plan, including:

- Subcontractor 1: Drilling company that can perform the following tasks - Drill, install, and develop 12 multi-level monitoring wells to a maximum of 600 feet below ground surface (bgs), install liner between downhole surveys and sample collection, rock coring (2 cores), boring, installation, and acquisition of appropriate permits, and on-site utility location and clearance
- Subcontractor 2: Geoprobe® company that can perform the following tasks - Continuous sampling with membrane interface probe (MIP), soil sampling, and installation and development of 10 monitoring wells in the overburden soils onsite
- Subcontractor 3: Background soil-boring sampling via direct-push and off-site utility location and clearance
- Subcontractor 4: Excavation to and around sampling locations in heavily vegetated areas
- Subcontractor 5: Geophysics company for downhole work
- Subcontractor 6: Surveyors for Mansfield Site features and monitoring wells
- Subcontractor 7: Non-RAS laboratory
- Subcontractor 8: Matrix Diffusion Analytical Services
- Subcontractor 9: Equipment rental for the following types of field work – geological, hydrogeological, ecological, and geophysical (e.g., XRF, GPS, metal detector, ATV, etc.)
- Subcontractor 10: Disposal of investigation-derived wastes (IDW) including soil, rock, groundwater, and excavated vegetation
- Subcontractor 11: Trailer rental company
- Subcontractor 12: Trash disposal company
- Subcontractor 13: Portable bathroom company
- Subcontractor 14: Electrician
- Subcontractor 15: Security fencing (or security guards, depending on safety risk)

Note that, due to location, cost, schedule, and/or scope of work activities, it is possible that the listed subcontractors above will need to be further subdivided. For example, it may not be possible or economically feasible to find laboratories that can perform the special analytical services as described, or a drilling company may not provide the services listed above or may have scheduling issues. EES will also endeavor to subcontract small businesses where possible, to follow the intent of EPA policy. Additionally, there may also be a need for on-site security during active field work events (evenings and weekends) if there are security problems which are not addressed by the security fence around the trailer and staging area.

Two phases of field work are anticipated for this project. It is anticipated that several of the same types of subcontractors will be required for both phases. For this reason, to the extent possible, subcontractor procurement activities will be based on planned Phase I requirements as well as reasonable assumptions regarding the Phase II scope of work that will be required, thus minimizing the anticipated LOE for procurement associated with Phase II activities. However, it should be noted that the scope of the Phase II field investigation will not be fully resolved until completion of the Phase I activities and review of the associated data. For this reason, the types of numbers of subcontractors required for Phase II may vary from the assumptions in this work plan.

Subtask 1.12 — Perform Subcontractor Management

EES will perform necessary management and oversight of any subcontractor(s) needed to implement the RI/FS SOW according to contract requirements. EES will review, approve, and monitor the subcontractor's quality assurance/quality control (QA/QC) program and conduct audits as required. EES will review and approve invoices and issue any necessary subcontract modifications.

Subtask 1.13 — Pathway Analysis Report

EES will prepare a Pathways Analysis Report (PAR) in accordance with OSWER Directive 9285.7-01 D-1, *"Risk Assessment Guidelines for Superfund Part D"* (EPA 2001). The PAR will provide a description of the HH and ecological risk assessment approaches and assumptions to be used in the risk evaluations. The PAR will provide information necessary to describe how the potential risks at the Mansfield Site will be evaluated. The PAR cannot be completed until samples (including those from Phase II) to be used in the human health risk assessment (HHRA) and the ecological risk assessment (ERA) have been collected and analyzed. In the SOW, the PAR is scheduled to be submitted 21 days after submittal of the DESR; however, the DESR includes Phase I data only. Therefore, the PAR due date will be revised so that it is not linked with delivery of the DESR. Rather, the PAR will be submitted to EPA within 60 days after Phase II laboratory data are validated and entered into the project database.

Human Health Risk Assessment PAR
The HHRA PAR will identify realistic exposure scenarios and exposure areas and depths, and specific exposure domains as appropriate. During development of the HHRA PAR, a site reconnaissance will be performed with EES and EPA human health risk assessors in attendance. The reasonable maximum exposure (RME) and central tendency exposure (CTE) scenarios (including potential receptors, exposure areas, exposure pathways, and exposure frequencies) and the preliminary conceptual exposure model will be identified and discussed. This step will facilitate preparation of an HHRA that yields realistic RME and CTE estimates, and will help streamline EPA review of the PAR.

The approach for the statistical treatment of the data, selection of contaminants of potential concern (COPCs), identification of exposure parameters, description of models and input selection, and identification of toxicological values will be provided. The approaches and assumptions used in the HHRA will be consistent with EPA guidance, primarily: *Risk Assessment Guidance for Superfund (RAGS), Volume 1: Human Health Evaluation Manual, Parts A, D, E, and F* (EPA 1989, 2001, 2004, 2009). The PAR will include Tables 1 through 6 of RAGS Part D (EPA 2001) and will address the RME scenario only (i.e., the need for CTE calculations will not be known at the time the PAR is prepared).

Ecological Risk Assessment PAR
The ERA PAR will describe the proposed approach for the Screening Level Ecological Risk Assessment (SLERA) to evaluate risk to the environment. The PAR will include a detailed description of the following key SLERA components:

- Preliminary Conceptual Site Model (CSM) – Emphasis will be placed on identifying the ecological receptors, exposure pathways, and assessment and measurement endpoints to be evaluated in the SLERA.
- Exposure Media Models for Comparison – Exposure media and proposed data groupings for the evaluation of direct and indirect (food-web) exposure pathways, and the models to be used for this evaluation will be described. Input parameters for the food-web models, including the bioaccumulation factors that will be used to estimate chemical concentrations in prey, will be included in the PAR, along with an identification of the literature-based sources of these values.
- Toxicological Values – The literature-based toxicological values to be used for the evaluation of direct and indirect exposure risks and the prioritized sources from which these toxicological values were selected for use in the SLERA will be identified. The results of the Ecological PAR evaluation for the SLERA will be reported in a technical memorandum (TM). EES also assumes that conference calls will occur between EPA and EES to complete the TM.

When EPA approval of the approach and assumptions presented in PAR is received, the RAGS Part D Tables 1-6 will be finalized and the quantitative risk estimates (RAGS Part D Tables 7-10) will be calculated and incorporated into the HHRA (see Subtask 7.1).

TASK 2 — COMMUNITY INVOLVEMENT

EES will provide community involvement support to EPA throughout the RI/FS in accordance with the *National Oil and Hazardous Substances Pollution Contingency Plan* (NCP, 40 CFR Part 300) and the *Superfund Community Involvement Handbook*, (Office of Emergency and Remedial Response, EPA 540-K-05-003, [EPA 2005a]). Based on the requirements specified in the SOW, EES has assumed the following activities to complete Task 2.

Subtask 2.1 — Community Interviews

EES will perform the following requirements under this subtask:

- Community Interviews Preparation – EES will review relevant background documents as provided by the EPA and will provide logistical support to the EPA, who will conduct interviews with the appropriate governmental officials (federal, state, county, township, city), environmental groups, local broadcast and print media, and any other relevant individuals or groups either in person or by telephone. EES anticipates that relevant background document review and summary will occur as described in Subtask 1.6 and therefore is not tasked under Subtask 2.1.
- Community Interviews Questions – EES will prepare and organize draft interview questions. EES will also prepare final interview questions incorporating EPA comments.

Subtask 2.2 — Community Relations Plan

EES will prepare a draft community relations plan (CRP) that presents an overview of the community's concerns and covers the following elements:

- Mansfield Site background including location, description and history
- Community overview including a community profile, concerns, and involvement
- Community involvement objectives and planned activities, with a proposed schedule for performance of these activities
- Mailing list of contacts and interested parties
- Names and addresses of the information repositories and public meeting facility locations
- Acronym List
- Glossary

EES will submit the final CRP incorporating EPA review comments. EES will also provide three-tiered QC review for draft and final versions of the CRP document, per contract requirement.

Subtask 2.3 — Public Meeting Support

EES will arrange for two public meetings, availability sessions, or open houses, including the selection and reservation of a meeting space over the course of the POP.

In addition to attending the public meetings or availability sessions, EES will perform the following activities:

- Provide recording and/or stenographic support.
- Prepare draft and final meeting summaries.

- Prepare presentation materials/handouts.
- Prepare Draft and Final Public Meeting Visual Aids **—** EES will develop draft visual aids (i.e., transparencies, slides, and handouts). For budgeting purposes, EES will assume 25 PowerPoint slides, 1 poster-board size display and 3 handouts for each public meeting.
- Final Public Meeting Visual Aids **—** EES will develop final visual aids incorporating EPA comments.
- EES will reserve a court reporter for the two public meetings. A full-page original and a "four on one" page copy, along with an electronic copy of the transcripts, will be provided to EPA, with additional copies placed in the information repositories as required.

Subtask 2.4 — Fact Sheet Preparation

EPA's RPM will prepare the Draft Fact Sheet. EES will perform a technical review and edit, as well as lay out and photocopy, the Fact Sheets.

EPA will prepare final Fact Sheets incorporating comments. After EPA approval, EES will attach mailing labels to the Fact Sheets before delivering them to EPA, who will mail them out. EES will assume two Fact Sheets, 6 to 8 pages in length apiece, with two illustrations per Fact Sheet. EES assumes 200 addressees per mailing.

Subtask 2.5 — Proposed Plan Support – Not Applicable

Subtask 2.6 — Public Notices

EPA will prepare newspaper announcements/public notices in support of each public meeting. EES will place the ads in the newspapers and assume the development of two newspaper advertisements (ads placed in newspapers) in the most widely read local newspaper. EES assumes that half of the ads will be placed in a large city newspaper and the other half in a small-town newspaper.

Subtask 2.7 — Information Repositories – Not Applicable

Subtask 2.8 — Site Mailing List

EES will update the site mailing list two times. Each mailing list will have about 100 entries. EES will provide EPA a copy of the mailing list on a compact disc when requested.

Subtask 2.9 — Responsiveness Summary Support – Not Applicable

TASK 3 — FIELD INVESTIGATION

Field investigation entails collecting environmental samples and information required to support the RI/FS. EES will perform remaining planning for this task under Task 1 - Project Planning and Support. Field investigation starts with EPA's approval of the site-specific QAPP and EES's submittal of the HASP developed under Task 1 and ends with the final demobilization of field personnel and equipment from the Mansfield Site.

Based on the Mansfield Site history, it appears that Dump Areas A through E are contributing sources to the groundwater contamination, namely, chlorinated volatile organic compounds (cVOCs) (e.g., TCE, chlorobenzene, cis-1,2-DCE) as identified from groundwater samples in the Residential Investigation Area. However, due to the forested nature of the dump areas, undefined site boundaries, unknown groundwater flow regimes and overall hydrogeology, there may be additional sources and affected media present in the surrounding area(s). Figures 1 and 2 show the Source Areas Investigation Area (outlined in dashed red line), where EES presumes sampling of various media will occur, as detailed below. Please

note that this boundary is highly flexible and will be refined once site-specific information (e.g. historical information and future analytical results) is evaluated. As the RI moves forward, EES will have a better technical basis, in terms of evaluating background and other data gathered from reconnaissance, scoping, and screening information, to delineate and refine these preliminary investigative boundaries that are presently drawn around the Source Areas Investigation Area, the Residential Investigation Area, and the Potential Residential Investigation Areas (see Figures 1 and 2).

Because of the uncertainties regarding contaminant source, fate, and transport, EES is proposing a two-phased field approach that will incorporate the following:

1. Investigate the Source Areas Investigation Area for potential additional sources at the surface, using site reconnaissance and field-screening techniques such as X-ray fluorescence (XRF) for metal concentrations and soil samplers/probes for detection and or quantitation of volatile organic compounds (VOCs).
2. Investigate the surface and subsurface glacial overburden based on both downhole *in situ* VOC analyses (membrane interface probe [MIP]) and laboratory analyses (Metals, VOCs, semi-volatile organic compounds [SVOCs], PCBs, pesticides, toxicity characteristic leaching procedure [TCLP], and synthetic precipitation leaching procedure [SPLP]). EES will target the glacial overburden investigation based on the field screening results.
3. Investigate bedrock structure and hydrolithology, through borings, corings, geophysical borehole logging, matrix diffusion analyses, etc. EES will target the bedrock investigation based on the direct-push soil boring results in the overburden.
4. Investigate and sample multiple media (surface water, sediment, surface and subsurface soils, groundwater, residential groundwater, residential air, and residential soil gas) to characterize the nature and extent of contamination.
5. Investigate groundwater flow regimes (shallow, mid-depth, and deep systems) through discrete depth interval pumping tests and groundwater sampling.

As described previously, the field work for this effort will be divided into two phases. Specifically, the primary goals of the **Phase I** investigation are to:

1. Identify additional potential sources of contamination at the Mansfield Site
2. Investigate the nature and extent of contamination in soil (overburden), surface water, sediment, and bedrock, as well as groundwater in shallow to mid-depth (approximately 100 to 400 feet bgs) fractured bedrock systems in the area of investigation
3. Identify the likely points of contaminant entry from overburden to bedrock
4. Investigate the nature and extent of contamination in residential areas (air, soil gas, and groundwater) based on historical analytical data and current groundwater flow diagrams
5. Collect updated groundwater quality data, including additional historical water quality and flow data
6. Conduct background soil, sediment, surface water, groundwater, residential air, and soil gas sampling.

The primary goals of the **Phase II** investigation are to:

1. Address potential data gaps from the Phase I investigation
2. Investigate the nature and extent of contamination in additional residential area(s) based on Phase I groundwater flow evaluation and modeling

3. Investigate the nature and extent of groundwater contamination in the deep bedrock system (approximately 400 to 600 feet bgs) based on Phase I groundwater sampling results, geophysical logging, and deep cores
4. Conduct surface geophysical surveys if warranted

It is anticipated that the types and procedures for Phase II field activities will be similar to those used during Phase I. Specific locations, numbers, and types of samples for Phase II will be updated based on the data from Phase I and will be specified in the Phase II QAPP Addendum. The Phase II QAPP Addendum will be developed upon completion of the Phase I field investigation (see Subtask 1.7).

EES will perform the following field activities or combination of activities for data acquisition in accordance with the EPA-approved site-specific QAPP. Where applicable, anticipated activities associated with each of the two phases of field work are described. Note that EES will attempt to identify opportunities for efficiency by scheduling multiple activities to overlap and to combine and minimize trips to the Mansfield Site whenever possible.

Additionally, EES will take representative photographs to document the RI field activities and significant events or observations made during the RI/FS. These activities will include contractor mobilization, collection of samples (including subsurface borings and cores), geophysical investigations, hydrogeological testing, ecological studies, treatability studies (if required), and demobilization. EES will photograph these activities so that the photographs will serve as a clear record of the procedures required to carry out each activity.

Subtask 3.1 — Site Reconnaissance

EES will conduct Mansfield Site surveys including property, boundary, utility ROWs, and topographic information. Prior to the official mobilization for Phase I RI field activities, EES will conduct site reconnaissance from historical documents and maps (described in Subtask 1.6) in the Residential Investigation Area and the Source Areas Investigation Area. During reconnaissance activities, EES anticipates:

1. Using a New Jersey-registered land surveyor to create a site base map to include property, boundary, well inventory, utility ROWs, topographic information, and other features of interest on the Source Areas Investigation Area and Residential Investigation Area. The base map will include latitudinal/longitudinal coordinates, and survey information will be properly referenced with the NJ State Plane System. EES will also use a New Jersey-registered land surveyor to survey installed monitoring wells. EES will provide oversight of the survey.
2. Using a global positioning system (GPS) to identify and record sampling locations and tie the coordinates into a site base map. Sampling locations (soil borings, surface water, sediment, etc.) will be surveyed by EES using GPS. It is anticipated that multiple visits will be required to record sampling locations and that the most efficient way to accomplish this activity is to conduct GPS activities in sequence with each task or subtask during both Phase I and Phase II field activities.
3. Establishing a monitoring well inventory based on historical logs and on-site well location confirmation.
4. Re-developing monitoring wells MW-1, MW-2, MW-3, if possible.
5. Conducting on-site field screening for VOCs (e.g., passive diffusion soil samplers or mobile soil gas chromatography [GC]) and metals (e.g., XRF) in surface soils onsite.
6. Scoping locations onsite for additional monitoring-well installation and rock-coring activities.

7. Scoping locations onsite for future environmental sampling (surface water, soil, sediment, residential indoor air/soil/groundwater).
8. Scoping locations offsite for background study areas (surface water, sediment, soil).
9. Scoping for ecological resource sampling (qualitative Mansfield Site evaluation).
10. Performing a cultural resource survey based on a records search – A dilapidated stone fireplace/hut was noticed during the initial Mansfield Site walk on June 27, 2012. Additionally, Stanhope, New Jersey, has its roots as a forge town and iron-manufacturing community in the 18th and 19th centuries.
11. Cataloging field photographs according to EPA SOW. As described in the introduction for Task 3, EES will take representative photographs to document RI/FS field activities (Subtasks 3.1 through 3.8) and other significant events or observations. EES will also store and maintain these photographs in electronic form and submit them to EPA on disk. For each photograph, EES will provide the time, date, location, and a brief explanation of what is being photographed. EES will download, rename, and describe each photograph as taken during RI activities.

Subtask 3.2 — Mobilization and Demobilization

EES will provide the necessary personnel, equipment, and materials for mobilization and demobilization to and from the Mansfield Site. EES will base the cost of this subtask on two separate mobilizations and two separate demobilizations, one for each phase of field investigations.

Mobilization activities include, but are not limited to, Mansfield Site screening and set-up. Screening includes identification of field support equipment, supplies, and facilities. Set-up activities include utility clearance, construction of a staging area, construction of decontamination area, assessment for need of security, field laboratory set-up, site-trailer set-up, utility installations and connections, installation of security fence around trailer and storage area, and clearing relevant portions of the Source Areas Investigation Area to facilitate equipment transportation and vehicle movements. Demobilization activities may include removal of equipment and restoration of site property.

Subtask 3.3 — Soil Boring, Drilling, and Testing

EES will conduct geological investigations including soil boring, drilling, rock coring, and testing to understand the extent of hazardous substances, pollutants, or contaminants (including waste materials) in surface soil, subsurface soil, and bedrock in the Source Areas Investigation Area. EES field personnel will oversee subcontractors that will be conducting the intrusive work (e.g., boring, drilling, coring) and downhole tests (packer testing and geophysics). Additionally, EES field staff will be conducting perimeter air monitoring during any intrusive activities in accordance with the EPA-approved site-specific HASP. The above listed work will be detailed under this task.

Other related subtasks, such as monitoring well installation and development and hydraulic testing (except packer testing), are described under Subtask 3.4 – Hydrogeological Assessment, while sampling activities are described under Subtask 3.5 – Environmental Sampling. EES realizes that there is much overlap in Subtasks 3.3, 3.4, and 3.5 and presents the above breakdown in scope for ease in managing the overall Task 3 field investigation. EES also estimates weekly calls between the Field Team Leader (FTL) and EES PM will occur during field activities will occur.

Soil Boring

Based on previous Mansfield Site boring logs and surficial geological maps from the area, the surficial deposits at Mansfield consist of the Netcong Till. This glacial till ranges in thickness from 1 to 30 feet thick and is a yellowish brown, poorly sorted, poorly stratified silty sand with some to many pebbles,

gravel, cobbles, and boulders (Stanford, et al. 1996). Specifically, the Netcong Till consists predominantly of sand, with 10 to 40 percent by volume of pebbles and cobbles, 5 to 10 percent by volume boulders (Stanford, et al. 1996). Glacial erratics (2 to 10 feet in diameter) litter the Mansfield Site. The depositional environment is interpreted to be proglacial, likely deposits left by drumlins, moraines, and glacier run-off. The majority of the glacial overburden in the vicinity of the dump areas ranges between 1 and 18 feet thick, with Dump Areas A, B, C, and E averaging around 2 to 5 feet thick, and Dump Area D considerably thicker. Glacial till overlies Proterozoic-age gneiss (Losee Gneiss) and pyroxene syenite, which appears to be highly fractured and faulted in the mid- to shallow depths (down to 300 feet bgs) (Volkert, et al. 1989). The Losee Gneiss is composed of medium-fine to medium-course grained, weakly foliated (southwest to northeast) gneiss (Volkert, et al. 1989). Dependent on domain, bedrock is also composed of pyroxene syenite, an intrusive igneous rock that is part of the Hopatcong Intrusive Suite (Volkert, et al. 1989). The depth to bedrock varies from less than 5 feet to approximately 30 feet bgs at Mansfield.

Although there are no explicit boring logs found showing depth to groundwater in the glacial till, it is expected that there may be thin, discontinuous ephemeral perched groundwater-bearing zones in the more silty lenses of the till and at the contact between the overburden and underlying crystalline bedrock (evidenced by weathered and/or wet overburden-bedrock contact in boring logs). It is assumed that the overlying glacial till and crystalline bedrock aquifers are hydraulically interconnected based on groundwater quality data from NJDEP and EPA. The depth to water-bearing zone in the bedrock is around 30 feet bgs, based on boring logs from MW-1 and MW-2, with static groundwater level at approximately 10 feet bgs. Groundwater flow in the Losee Gneiss is preferential along faults, fractures, joints, and foliations. It is also affected by localized pumping of private and public supply wells (Bakeman 2010).

For the Phase I RI, a soil boring field investigation will be conducted and optimized based on the surface soil field screening (e.g. XRF, soil vapor) results. The main objective of the soil boring study is to investigate points of contaminant entry from overburden to bedrock. EES anticipates that soil borings will be advanced using hydraulic-push boring methods. Prior to the soil boring investigation, EES anticipates clearing gridlines in areas of interest based on the VOC field screening results. Clearing gridlines will enable access for the hydraulic direct-push vehicle and sampling of the subsurface.

EES presumes that sampling locations will be based on the future background document evaluation as well as scoping/reconnaissance and soil screening (XRF, soil vapor) activities prior to any intrusive field investigations. It is EES's intent to investigate potential source areas and confirm known source areas (those that have been excavated) in and around the Source Areas Investigation Area (non-residential) (see Figures 1 and 2). Based on a review of EPA's June 2010 Aerial Photographic Analysis Report (EPA 2010) and the State of New Jersey aerial photographs dating to the 1930s, the current-day bike path was an unpaved road that was likely used by trucks that conveyed drums for disposal in the dump's trenches. Due to terrain steepness, it is possible that some waste, potentially liquid, could have been released outside of these trenches, as well as on either side of the access road. Figures 1, 2, 3, and 4 show the approximate area where the "on-site" field investigation will occur for both soil and groundwater media.

This area will be referred to as the "Source Areas Investigation Area." As of this work plan, the Source Areas Investigation Area has been delineated on attached Figures, with no specific overburden soil boring or MIP investigation sampling locations indicated. Specific soil sample locations will be shown in QAPP figures after the Mansfield Trail Dump background document review has been completed. Additionally, once this review is completed, the proposed Source Area Investigation Area boundary may also be refined based on reviews of historical information and future analytical results.

EES anticipates that the overburden reconnaissance, scoping, screening, MIP sampling, and overburden monitoring well installation (see subtask 3.4) will occur in the Source Areas Investigation Area, for potential source areas. That is, non-residential areas immediately adjacent to and beyond the current source areas (excavated dump areas) (see Source Areas Investigation Area in Figures 1 and 2). The overburden activities are anticipated to occur only during Phase I, primarily because the known (dump areas) source area has no overburden to delineate. As indicated, additional direct-push soil sampling may occur during Phase II, if additional source areas are found, or additional overburden-to-bedrock entry points need to be assessed. However, this will be determined after the Phase I data synthesis and evaluation, with recommendations provided in the DESR (see Task 6).

- Overburden Soil Boring and Membrane Interface Probe
  EES anticipates using a MIP with electron capture detector (ECD) and photoionization detector (PID) to characterize cVOCs in the soils. The MIP is a direct-push, real-time, continuous direct-sensing, quantitative tool. Due to the heterogeneous nature of glacial till, characterizing cVOCs requires extensive horizontal and high-resolution vertical delineation, which MIP technology can provide. Because MIP technology provides real-time data in the field, it allows optimization of time, materials, and efforts. The MIP profiling tool also evaluates properties such as hydraulic conductivity, electrical conductivity, pressure, and flow with depth in real-time. Additional soil samples from discrete intervals will need to be collected and sent for laboratory analysis to confirm the MIP results. It is likely that additional discrete-interval soil samples will also need to be collected from locations inaccessible to the MIP or from areas where the glacial till becomes too gravelly at depth for the probe to advance. Additionally, data generated from MIP can be used to develop a three-dimensional image of subsurface conditions in the glacial till. This is especially important in evaluating where silt lenses are located (preferential groundwater pathways) and the potential three-dimensional distribution of DNAPL contamination.

  EES estimates for Phase I of the RI field investigation, a total of up to 70 MIP and 20 non-MIP soil (90 total) borings will be advanced with a direct-push rig, with up to an additional 10 non-MIP soil borings during Phase II (total for both phases is up to 100 direct-push borings). The number and location of Phase II soil borings will be recommended in the DESR and approved by EPA prior to any Phase II field work. EES estimates that, of the total number of MIP soil borings advanced, up to 30 percent will have surface and subsurface soil samples collected and sent for laboratory confirmation analyses for VOCs, SVOCs, PCBs, pesticides, and metals. This soil sampling effort will be further described under Subtask 3.5 – Environmental Sampling.

  Phase I soil overburden activities include a maximum of 20 direct-push borings and 70 MIP borings.
  Phase II soil overburden activities include up to an additional 10 direct-push borings (non-MIP).

- Background Soil (Overburden) Boring
  During Phase I, off-site background soil samples (non-MIP) will be collected from the area surrounding the Mansfield Site. EES anticipates that up to 10 soil borings will be advanced to the top of the water table (or refusal, whichever the shallower depth). Surface and subsurface soil samples for the background evaluation will be collected and sent for laboratory analysis. Direct-push subcontractor costs are included under this task, while the sample collection by a field geologist is detailed and under Task 3.5 – Environmental Sampling.

Drilling
EES anticipates drilling to a maximum depth of 600 feet bgs in order to install 12 multi-level monitoring wells with 6 sampling ports. Drilling locations will be decided based on information evaluated and

synthesized from the soil field screening results, soil MIP results, and soil-boring analytical data, as well as any available bedrock geophysical measurements. Total borehole depths will be established based on the in-field results from hydrogeological and geophysical assessments, largely downhole geophysics and packer testing, as described below. EES anticipates investigating the shallow and middle-depth (approximately 100 to 400 feet bgs) fractured bedrock groundwater systems during Phase I, and drilling up to 8 boreholes for multi-level monitoring well installation. Based on the information obtained and evaluated in Phase I, EES will investigate the deep (approximately 400 to 600 feet bgs) bedrock groundwater system during Phase II activities, and drill (with EPA approval) the remaining number of scoped boreholes (4) as are recommended in the post-Phase I DESR. EES will prepare and maintain logs of each borehole, keep a logbook and record formation cuttings, types, drilling rates, and blown yield, as well as photograph drilling activities.

Downhole geophysics and packer testing will be conducted in each borehole to help establish discrete water bearing depths in the fractured bedrock as well as the extent of vertical contamination. Boreholes will be developed prior to testing by the driller. Initially, the standard suite of downhole geophysical tests (i.e., caliper, temperature, conductivity, electrical resistivity, gamma, deviation testing), as well as acoustic televiewer (ATV) and optical televiewer (OTV) will be conducted in each borehole. These tests will be used to select zones for heat-pulse flow-meter (HPFM) logging. EES anticipates conducting both static (natural) and dynamic (pumped) HPFM testing. The HPFM testing will include pumping and logging in the same borehole (intra-well testing), as well as pumping in one borehole and logging in surrounding boreholes. The HPFM testing can provide critical information to evaluate fractured bedrock flow and contaminant transport. The results of the HPFM logging will be used in addition to geophysical results and other available information to identify intervals for packer testing.

Ultimately, a discrete-zone multi-level monitoring system (specified in Subtask 3.4 – Hydrogeological Assessment) will be designed based on the results of these hydraulic and geophysical assessments. During downhole activities, EES will prepare and maintain geophysical logs of each borehole, keep a logbook, and photograph downhole geophysical activities and packer testing.

To minimize the possibility of cross-contamination, liners will be placed in boreholes immediately after drilling; and then removed for geophysical borehole logging and packer sampling, reinstalled, and then removed for completion of the borehole as a monitoring well. EES assumes the liners will need to be inserted and removed two times per borehole.

Based on discussions with relevant subcontractors and professional experience, EES estimates the following to conduct drilling and testing in the bedrock:

Phase I drilling activities as outlined above will include:

- Drilling 8 boreholes in the shallow to middle depth bedrock and associated packer testing
- Downhole geophysics, including caliper, fluid temperature, fluid resistivity, normal resistivity, natural gamma ray, ATV, and OTV in 8 wells and 2 core holes
- HPFM in 8 pumped wells, 2 pumped zones per well, and 4 monitored wells per pumped monitoring well

Phase II drilling activities as outlined above will include:

- Drilling 4 boreholes in the deep bedrock and associated packer testing
- Downhole geophysics, including caliper, fluid temperature, fluid resistivity, normal resistivity, natural gamma ray, ATV, and OTV, in 4 deep wells completed to a depth of 600 feet bgs
- HPFM in 4 pumped wells, 2 pumped zones per well, and 4 monitored wells per pumped monitoring well

Rock Coring

Depending upon the extent of fracturing and the primary porosity of the rock matrix, it is possible that there is contaminant mass transfer between the fractures and rock matrix. In order to evaluate the full extent of contamination, rock core sampling and matrix diffusion analysis will be employed. As described in the SOW, EES assumes 2 total rock cores (1 shallow to mid-depth bedrock core at no more than 400 feet bgs and 1 deep bedrock core at no more than 600 feet bgs) will be collected with 25 sample intervals per core. Actual, total completed boring depths for rock cores will be decided depending on other borehole information and geophysical logging collected from the previous drilling for the multi-level well installations as well as by the lead field geologist in conjunction with input and consensus from the EPA RPM and EES PM.

Matrix diffusion analysis is a unique solution for investigating contamination in fractured bedrock aquifers. EES will conduct rock core sampling, extracting, and analyzing contaminants present within the rock matrix to assess the effects of diffusion of contaminants from fractures into the rock matrix. Studies show that much of the contaminant mass may reside in low-permeability rock matrix (e.g. gneiss), but downgradient transport occurs in fractures. Further, contaminant concentrations in the fractures and the matrix are not in equilibrium, thus sampling only the groundwater from the fractures cannot provide the overall mass distribution. Samples are typically taken from just above and below a fracture with other core samples taken from non-fractured areas for comparison of chemical concentrations/signatures.

Rock coring is anticipated to occur towards the end of Phase I field activities, after the multi-level well boreholes have been drilled and downhole geophysical logging completed. This information will allow EES to target the rock-coring locations. Specifically, during the later stages of the Phase I investigation, EES anticipates conducting two core boreholes in source entry to bedrock locations that the earlier Phase I field activities will have identified. For costing purposes, EES assumes the Phase I shallow to mid-depth bedrock core will likely occur down to a depth of approximately 100 to 400 feet bgs and the second core will be drilled in deep bedrock, likely down to a depth of approximately 400 to 600 feet bgs to examine the source migration away from the bedrock entry zones. EES also plans on ATV, OTV, and incorporating downhole geophysics during the rock-coring program, so that oriented rock cores are obtained. Boreholes will also be developed prior to testing by the driller. EES assumes the liners will be installed after the coring process, used during downhole activities, and removed prior to borehole completion or possibly monitoring well installation.

EES will prepare and maintain logs of each borehole, keep a logbook, and record formation type(s), coring rates, and blown yield, as well as photograph coring activities. Sampling efforts of the bedrock coring, including in-field laboratory preparations or pre-treatments, are specified under Subtask 3.5 – Environmental Sampling. EES assumes field geologists will be needed for coring oversight and core sampling, averaging approximately 50 linear feet per day.

Phase I rock coring and associated activities as outlined above include one shallow to middle depth bedrock core and one deep bedrock core.
Phase II: no rock coring or associated activities are planned.

EES will attempt to use the boreholes created from coring for multi-level well installation (Phase II) if possible. Typically, the core holes need to be drilled with HQ-3 triple tube coring to minimize core breakage. EES plans to work closely with a drilling subcontractor to streamline and economize the drilling, coring, and monitoring well activities, so that the minimal number of holes are drilled or cored but still meet the objectives of the bedrock field program. However, certain coring requirements may preclude using cored boreholes as potential monitoring well locations.

Subtask 3.4 — Hydrogeological Assessment

EES will conduct hydrogeological investigations of groundwater to evaluate the horizontal and vertical distribution of hazardous substances, pollutants, or contaminants in the groundwater and the extent, fate, and transport of any groundwater plumes containing hazardous substances, pollutants, or contaminants. Source Areas Investigation Area groundwater and Residential Investigation Area drinking-water results are presented in Figure 3. Figure 3 shows exceedances of the cis-1,2 DCE, TCE, and VC New Jersey Groundwater Quality Standards (NJGWQS) in the Source Areas Investigation Area monitoring wells and exceedances of the TCE and cis-1,2 DCE New Jersey Drinking Water Standard (NJDWS) in the Residential Investigation Area. However, these data provide limited information regarding the hydrogeology of the Mansfield Trail Dump Site and vicinity. EES will complete a hydrogeological assessment evaluating:

1. Contaminant source areas
2. Contaminant entry from surface to overburden
3. Contaminant entry zones from overburden to bedrock
4. Contaminant bedrock migration away from source entry zones
5. Contaminant discharge areas (e.g., seeps, streams) and/or impacted and potentially impacted residential areas

To perform a full hydrogeological investigation, EES will install and develop new monitoring wells in both the overburden and bedrock aquifers, conduct downhole geophysics (see Subtask 3.3 – Soil Boring, Drilling, and Testing), survey top of monitoring well casing and surface water elevations, conduct packer tests, HPFM tests, cross-well pumping tests (see Subtask 3.3 – Soil Boring, Drilling, and Testing), and sample monitoring wells (see Subtask 3.5 – Environmental Sampling). Additionally, EES will conduct a groundwater/surface water interaction evaluation. As noted above, EES assumes that the hydrogeological field investigation will occur in two phases, Phase I and Phase II.

EES has listed below, for completeness, hydrogeological tasks that are part of the groundwater assessment. However, some of these items are included as part of the 3.3 – Soil Boring, Drilling, and Testing subtask above, or as part of the 3.5 – Environmental Sampling subtask below.

EES anticipates that the following tasks will be completed during Phase I (overburden wells) or Phase I and Phase II (bedrock wells) of the hydrogeological investigation, as described below.

- Monitoring well installation and development in glacial overburden aquifer: Based on the results of the Phase I soil boring investigation, EES anticipates the installation of up to 10 monitoring wells (see Figure 4), screened in the glacial overburden aquifer. As described in Subtask 3.3, the glacial till may be as thick as 30 feet in this area of New Jersey (non-excavated areas), based on surficial Quaternary geology maps (Stanford, et al. 1996). Therefore, the existence of an overburden layer and potential overburden aquifer constitutes a potential pathway for contaminants from surface source areas to the bedrock aquifer below. As shown in Figure 4, 10 potential overburden monitoring well locations are proposed in the Source Areas Investigation Area, based on groundwater and residential drinking water analytical results (Figure 3) and presumed up- and downgradient flow paths of groundwater. However, these locations are preliminary and may be refined during the background document investigation, during the revision of the CSM in the site-specific QAPP, and/or after preliminary data are obtained from the soil screening, and soil overburden investigation. Final overburden monitoring well locations will be discussed with the EPA WAM and agreed upon by EPA prior to any intrusive activities by EES.

EES assumes that direct-push technology can be used for this effort. However, if the glacial till proves impenetrable for this technology, other drilling options (e.g., rotosonic) may be implemented in the overburden aquifer. At this time, EES does not anticipate any additional installation of overburden monitoring wells during Phase II. EES will conduct the oversight of overburden monitoring well installation and development. EES assumes installation of 1.5 overburden monitoring wells per day via direct-push technology and development of three monitoring wells per day.

Phase I overburden well installation and development activities include up to 10 wells (see Figure 4).

At this time, EES does not anticipate installing overburden wells in the Residential Investigation Area (as delineated in Figure 2), as contaminated groundwater appears in the bedrock in this area (see Figure 3).

- Multi-level monitoring well installation and development in bedrock aquifer: EES will install up to 8 shallow and middle-depth (100 to 400 feet bgs) multi-level monitoring well systems during Phase I activities (see Figure 4) and up to 4 deep (400 to 600 feet bgs) multi-level monitoring wells during Phase II activities. These wells will be installed in order to evaluate impacts to groundwater, as well as groundwater flow direction(s), elevations, and flow rates. Monitoring well locations will be decided based on information obtained from the soil field screening results, soil MIP results, soil boring analytical results, subsurface downhole geophysical measurements, and bedrock drilling and rock coring information. Depths of sampling ports will be based on downhole geophysics, ATV, HPFM, and packer tests. Liners will be placed in boreholes immediately after drilling and in between conducting downhole geophysics and completing the borehole as a monitoring well. Newly installed groundwater wells will be developed in accordance with the EPA-approved site-specific QAPP and cited SOPs. EES anticipates installing and developing a total of 12 multi-level monitoring well systems during Phase I and Phase II. EES anticipates that these locations will occur in the Source Areas Investigation Area. Presumably, the monitoring well location configuration involves placing wells up- and downgradient of the now-excavated source areas.

  Figure 4 shows proposed shallow and middle-depth multi-level monitoring well locations for Phase I activities. These locations are based on the analytical results from groundwater in MW-1, MW-2, and MW-3 in the Source Areas Investigation Area, as well as from drinking water results from the Residential Investigation Area to the northeast (see Figure 3). The 8 proposed shallow and middle-depth multi-level monitoring well locations are within the Source Areas Investigation Area. However, these locations are preliminary and may be refined during the background document investigation, during the CSM development in the site-specific QAPP, and/or after preliminary data are obtained from the soil screening, and or soil and groundwater overburden investigations. Final monitoring well locations will be discussed with the EPA WAM and agreed upon by EPA prior to any intrusive activities by EES.

  At this time, EES does not anticipate installing bedrock wells in the Residential Investigation Area during Phase I. Based on analytical results (see Figure 3), TCE and cis-1,2-DCE have been detected at levels exceeding the NJDWS (October 2009) in water originating from the bedrock aquifer. If additional bedrock multi-level monitoring wells were installed in the Residential Investigation Area, such installation would occur after the Phase I assessment of data is present in the DESR. Additionally, the topography of the Residential Investigation Area is approximately 250 to 300 feet below the apex of the Source Area Investigation Area. Most private wells in the

Residential Investigation Area are 200 to 300 feet bgs, indicating that this groundwater regime is middle to deep bedrock and to be investigated during Phase II.

This phased approach is a top-down, step-wise procedure with the subsurface investigation as follows: overburden→shallow bedrock→middle bedrock→deep bedrock, with emphasis on characterizing and delineating groundwater "entry points" from each subsurface regime.

Phase I multi-level well installation activities include installation and development of up to eight wells.
Phase II multi-level well installation activities include installation and development of up to four wells.

- Downhole geophysics and packer testing: Downhole geophysics, packer testing, etc. will be conducted at the completion of a borehole, prior to installation, and therefore are described under Subtask 3.3.

- Geographic surveying: A New Jersey- registered land surveyor will conduct a survey to establish the horizontal position and elevation of new monitoring wells and staff gauges during **Phase I** and **Phase II** activities. The specifics for this survey subtask are included under Subtask 3.1 - Site Reconnaissance.

- Hydraulic conductivity testing: EES will conduct slug tests in MW-1, MW-2, and MW-3 (EPA and NJDEP Mansfield Site monitoring wells). It is likely that cross-hole testing (i.e., short-term pumping tests) as well as borehole pumping tests will be conducted to evaluate bedrock transmissivity and anisotropy. The borehole pumping tests (e.g., step, constant rate, recovery) typically occur over 1 to 3 days (assume 2 days for costing estimate) and will be conducted in 6 representative wells, 2 from each of the different groundwater regimes (shallow, mid-depth, and deep) during Phase I (4 wells) and Phase II (2 wells) field activities. EES assumes slug tests can be performed on the three (MW-1, MW-2, MW-3) monitoring wells in one day and field staff will be present to conduct each of these tests.

  Phase I activities include pumping test activities in four multi-level wells and three monitoring wells.
  Phase II activities include pumping test activities in two multi-level wells.

- Water level survey: The description and assumptions for **Phase I** and **Phase II** water level surveys, which typically occur during the same events as the groundwater sampling, are included under Subtask 3.5 – Environmental Sampling.

- Groundwater sampling: The description and assumptions for **Phase I** and **Phase II** groundwater sampling are included under Subtask 3.5 – Environmental Sampling.

- Groundwater/surface water interaction evaluation: There are no expected field activities for this subtask during the Phase I hydrogeological investigation. The groundwater to surface water interface will be evaluated and a course of action will be recommended in the DESR (Task 6). A potential activity would be to conduct pore-water temperature mapping along surface-water channels to identify groundwater discharge areas. EES will move forward with a Phase II groundwater/surface water interaction evaluation only with the approval of EPA. At the very least, EES anticipates estimating locations where plumes may be discharging and performing sampling activities (see Subtask 3.5) at such locations during Phase II.

Subtask 3.5 — Environmental Sampling

Environmental sampling includes the following activities as outlined in the SOW:

- Field screening – see Subtask 3.1, #4 – Soil VOC and metals field screening efforts are detailed under the Site Reconnaissance subtask.

- Groundwater sampling – After Phase I and Phase II well developments are completed, EES will collect a full round of groundwater samples from monitoring wells (including MW-1, MW-2, MW-3) to support the RI. EES assumes that 8 Phase I multi-level bedrock monitoring wells and 10 overburden monitoring wells will be sampled after their completed installation and development during Phase I sampling activities. For Phase II groundwater sampling activities, 12 multi-level bedrock monitoring wells (4 new from Phase II), 10 overburden monitoring wells, and the three single-level bedrock monitoring wells will be sampled after the Phase II multi-level monitoring well installation and development are complete.

  All groundwater samples will be analyzed for VOCs, SVOCs, PCBs, pesticides, metals, total organic carbon (TOC), and hardness. Measurements of standard field parameters (such as dissolved oxygen, specific conductance, pH, oxidation-reduction potential [ORP], turbidity, and temperature) will be collected at sample locations in accordance with EPA's low-flow protocol. Additional specialized, non-Contract Laboratory Program (CLP) analyses (i.e., speciated chromium and PCB congeners) may be conducted during Phase II, but are not included at this time. EES assumes that one multi-level well (6 ports) can be sampled per day and three open wells (MW-1, MW-2, and MW-3) can be sampled in a day. Overburden monitoring wells can be sampled at an average of 2.5 per day.

  Phase I groundwater sampling includes groundwater elevation measurements, well stabilization, and sampling of MW-1, MW-2, MW-3, 10 overburden wells, and the 8 Phase I-installed multi-level monitoring wells.

  Phase II groundwater sampling activities will include the same wells as sampled during the Phase I field event, and will include 4 Phase II-installed multi-level monitoring wells.

- Residential water supply sampling – EES will collect a full round of groundwater samples from identified residential properties in the Residential Investigation Area to support the RI. EES will also assist EPA to prepare letters and obtain access agreements for each property owner prior to RI sampling. Residential well sampling may be performed concurrently with or in advance of the Source Areas Investigation Area monitoring well sampling event. EES assumes that, at a minimum, the 18 residences with POETS will be sampled. After completion of the background document evaluation, including the previous residential well sampling results, the final number of wells to sample will be decided. The groundwater samples will be collected from before the POETS and will be analyzed for VOCs, SVOCs, PCBs, pesticides, metals, TOC, and hardness. Measurements of standard field parameters (such as dissolved oxygen, specific conductance, pH, ORP, turbidity, and temperature) will be collected at sample locations. Additional specialized, non-CLP analyses (i.e., speciated chromium and PCB congeners) may be conducted during Phase II.

  As discussed during the September 19, 2012 conference call, the residential well sampling may be performed in advance of other field activities. Therefore, a separate field mobilization may be required.

EES may also sample residential water supplies from residences in addition to the 18 identified residences, to assess whether there have been any changes to the groundwater plume. The number of additional residences to be sampled will be evaluated after a review of historical information and consultation with EPA.

- Surface and subsurface soil sampling – Based on the site survey, field screening, and background survey conducted in the Source Areas Investigation Area during Subtask 3.1 – Site Reconnaissance, EES will then conduct surface and subsurface soil sampling in the on-site Source Areas Investigation Area, as well as an off-site background soil sampling event. Soil sampling will occur at up to 30 percent of the estimated 70 MIP soil borings (21 sample locations) and in 100 percent of the 30 non-MIP soil boring locations (including the 10 background sampling locations) during Phase I; and at up to 10 soil boring locations during Phase II (see Subtask 3.3). This results in a maximum of approximately 51 Phase I surface and subsurface soil samples each and 10 Phase II surface and subsurface soil samples each.

  All collected soil samples for laboratory analysis will be analyzed for VOCs, SVOCs, PCBs, pesticides, and metals through a CLP laboratory. The Toxicity Characteristic Leaching Procedure (TCLP) and Synthetic Precipitation Leaching Procedure (SPLP) will also be conducted on up to 20 percent of those soil samples sent for laboratory analyses (non-MIP soil boring samples) if metals are found to be of concern during the XRF field screening investigation. If metals are not found to be of concern during the XRF field screening, a much lower percentage will be tested for TCLP and SPLP. TCLP and SPLP results will be used to provide needed disposal and leaching information for the RI Report and FS Report. Specifically, TCLP results will be used to calculate soil-disposal costs for various remedial alternatives, which will be based on soil-volume calculations and hazardous *vs.* non-hazardous transport and disposal options in the FS Report. SPLP results will be used in discussions of fate and transport in both the RI and FS Reports. TCLP will be performed under CLP, while SPLP analyses will be performed through a subcontracted laboratory as specified under Task 4.

  Surface and subsurface soil samples for the background evaluation will be collected offsite and sent to a CLP laboratory for analysis during Phase I activities. The analyses will likely include metals and SVOCs only. As stated under Subtask 3.3, 10 soil borings will be advanced; EES will collect surface and subsurface soil samples. Soil boring advancement subcontractor and EES oversight costs are included under Subtask 3.3 – Soil Boring, Drilling, and Testing.

  Phase I activities include on-site soil boring sampling (MIP and non-MIP) activities for up to 41 surface and 41 subsurface samples. Off-site background soil boring sampling activities will include up to 10 surface and 10 subsurface samples (Metals and SVOCs only) as well as the appropriate number of QC samples.

  Phase II activities include soil boring sampling (non-MIP) activities for up to 10 surface and 10 subsurface samples and the appropriate number of QC samples.

- Surface water and sediment sampling – Based on the survey and background survey conducted in the Source Areas Investigation Area during Subtask 3.1– Site Reconnaissance, EES will conduct surface water and sediment sampling as well as an off-site background sampling event.

EES anticipates collection of up to 30 surface water samples and co-located sediment (if present) samples during Phase I from existing surface water bodies onsite and adjacent to the Mansfield Site (e.g., Lubbers Run).

EES anticipates the collection of up to 10 surface water and co-located sediment samples during Phase II. The exact number and location of Phase II surface water and co-located sediment samples will be recommended in the DESR and approved by EPA prior to any Phase II field work. During either Phase of field activities, EES also anticipates sampling any surface seeps that are present.

Surface water samples will be analyzed for VOCs, SVOCs, PCBs, pesticides, metals, TOC, and hardness. Field parameters (such as dissolved oxygen, specific conductance, pH, ORP, turbidity, and temperature) will be measured at sample locations. Sediment samples will be collected and analyzed for VOCs, SVOCs, pesticides, PCBs, and metals.

Phase I surface water and sediment activities include sampling of up to 30 surface and 30 sediment locations.

Phase II surface water and sediment activities include sampling of up to 10 surface and 10 sediment locations.

- Surface water and sediment samples for background evaluation will be collected offsite and sent to a CLP laboratory for analysis during Phase I activities only. A total of 20 co-located surface water and sediment samples will be collected. The background surface water and sediment samples will be analyzed for the same parameters as the onsite samples. Surface water samples will be analyzed for VOCs, SVOCs, PCBs, pesticides, metals, TOC, and hardness. Sediment samples will be collected and analyzed for VOCs, SVOCs, pesticides, PCBs, and metals. The data will be useful for evaluating potential fate and transport of chemicals from one environmental medium to another.

  The rationale for the inclusion of SVOC analysis of background samples is that these chemicals need to be identified during the RI for Mansfield Site characterization purposes, and later for use in the FS to develop preliminary remediation goals (PRG). Both on-site and background chemical data are needed to support risk characterization (HHRA phase) and then risk management (FS phase). Additionally, in the case of SVOCs, specifically PAHs (and some metals), due to their ubiquitous presence and continuing aerial deposition on the ground surface due to modern practices (i.e., fossil fuel combustion, waste incineration, etc.). PAHs (and to some extent metals) need to be considered as to whether they represent a significant background presence.

  Phase I background surface water and sediment sampling activities will occur for up to 20 surface and 20 sediment samples.

- Air monitoring – Perimeter air monitoring will be conducted during intrusive field activities. EES anticipates conducting calibration of equipment over the duration of intrusive activities only (drilling, boring) during both Phase I and Phase II field activities.

- Vapor Intrusion (VI) sampling (Indoor air/sub-slab monitoring) – In 2005, NJDEP sampled 75 private drinking wells in the Brookwood Drive, Brookwood Road, and Ross Roads neighborhood. A total of 18 private residential wells were found to be contaminated with TCE. Since then, EPA has conducted sampling events of these residential units and schools near the

Mansfield Site; these events included collection of indoor air, sub-slab soil gas, and outdoor ambient air samples (EPA 2012b). The latest sampling event included collection of indoor air, sub-slab soil gas, and outdoor ambient air samples at 17 residences in the targeted neighborhood in March 2012. For this work plan, EES assumes that the impacted residential area(s) from the Mansfield Site are confined to the EPA-targeted neighborhood and anticipates continuing with the sampling of the 17 residences for VI sampling. However, should additional residences be identified as potentially threatened by VI associated with the Mansfield Site during the RI, EES will notify EPA to discuss the potential expansion of the VI sampling program. Additionally, EES will develop a site-specific QAPP using the sampling approach developed in the EPA-ERT's sampling plan. Analytical services to be secured for the VOC analysis of vapor samples will follow Region 2's SOP HW-32, Revision 7. Sampling activities are anticipated to occur during both **Phase I** and **Phase II** field activities.

- Rock Core Sampling (matrix diffusion analyses - see subtask 3.3)

Subtask 3.6 — Ecological Characterization

A qualitative Mansfield Site evaluation by the ecological risk assessor is recommended prior to development of the PAR. The purpose of the evaluation is to integrate available Mansfield Site information so that the on-site habitats and potential exposure pathways and receptors can be qualitatively characterized for the SLERA evaluation. Wildlife and aquatic life observed during the site visit (conducted as part of Subtask 3.1) will be integrated with other available literature-based information as part of Subtask 3.6, to qualitatively characterize the on-site and surrounding habitat areas and to identify ecological exposure pathways and receptors that are potentially complete and that warrant detailed evaluation in the SLERA. Endangered species, other species of special concern, and the presence of wetland habitats will be identified through literature-based sources as part of the Problem Formulation for the SLERA, as documented in Subtask 7.2.

The SLERA will be completed immediately following the Phase I investigation if sufficient soil, sediment, surface water, and groundwater data have been collected during the Phase I investigation. If additional samples are collected from media relevant to ERA during the Phase II investigation, then the SLERA will not be completed until the Phase II data can be integrated into the SLERA evaluation.

The following site-specific investigations will be completed as part of the Baseline Ecological Risk Assessment (BERA) and have not been described within this work plan:

- Mansfield Site-specific wetland and habitat delineation/function and value assessment
- Quantitative benthic community characterization
- Biota sampling/population studies
- Bioassays
- Bioaccumulation studies

These investigations will be considered if the SLERA indicates a potential ecological risk, and if such investigations are necessary to further characterize ecological risk to specific receptors. If a BERA is deemed necessary, a revised work plan will be prepared to define the site-specific investigations required to further characterize risk and complete the BERA.

Subtask 3.7 — Geotechnical/Geophysical Survey

EES will not initiate this subtask until directed by EPA. Per an EPA-email dated November 28, 2012, it is assumed that there is a potential that 80 acres of the site may require geophysical surveying (EPA 2012c).

Currently, EES does not anticipate the need for surface geophysical surveys within the context of the proposed field approach. Possible geophysical surveys (if initiated by the EPA RPM and PO) include:

- Magnetometer Survey
- Electromagnetic Survey
- Ground-Penetrating Radar (GPR)
- Remote Sensor Survey/Aerial photographic analysis – has already been performed by EPA (EPA 2010).

Subtask 3.8 — Investigation Derived Waste Characterization and Disposal

EES will characterize and dispose of IDW as specified in the EPA-approved, site-specific QAPP and in accordance with local, state, and federal regulations (see the Fact Sheet, *Guide to Management of Investigation-Derived Wastes*, 9345.3-03FS [EPA 1992]). The proposed drilling, coring, boring, and well-installation techniques will result in overburden soils and rock to be containerized in drums and roll-off dumpsters to be managed as IDW during both Phase I and Phase II field activities. Soils and rock will be contained and characterized for disposal and are assumed non-hazardous.

Groundwater extracted from the subsurface will be managed as IDW. EES estimates wastewater will be generated from boring, drilling, developing, and sampling 12 multi-level monitoring wells and 10 overburden wells. Additionally, EES anticipates that large quantities of wastewater will be generated from various pump (HPFM and borehole) tests during both phases of field activities. Groundwater wastewater will be containerized for disposal and is considered non-hazardous.

EES will likely conduct disposal activities at the end of each field phase. Additionally, EES will consider on-site management of IDW water to avoid or reduce transportation and disposal costs associated with the IDW water generated.

TASK 4 — SAMPLE ANALYSIS

This task includes only the subcontract costs associated with the analysis of samples where it becomes necessary for EES to procure analytical services. It is Regional policy for EPA to use analytical services provided by the government whenever possible before requiring EES to procure analytical support. Such services include the Central Regional Laboratory (CRL), CLP, the Environmental Response Team (ERT) laboratory, or regionally procured laboratories. As detailed in Task 3, EES intends to send soil, sediment, groundwater, surface water, and vapor samples to CLP (or via a region-specific contract through CLP [e.g., TO-15 analysis]) for VOC, SVOC, PCB, pesticide, metals, and TCLP analyses, and a subcontracted laboratory for SPLP, TOC, and hardness analyses.

Subtask 4.1 — Innovative Methods/Field Screening Sample Analysis

EES anticipates conducting soil screenings for metals and VOCs as described in Subtask 3.2. There are no other anticipated innovative methods or field screening sample analyses to be described under this task.

Subtask 4.2 — Analytical Services Provided via CLP, DESA, or EPA-ERT

As directed by the June 28, 2012 SOW, EES has assumed that the bulk of sample analyses will be conducted by an EPA CLP laboratory. However, certain analyses have been assumed to require non-CLP labs. These non-RAS analyses are included in Subtask 4.3 below. Sample management tasks are included in Subtask 5.2 below.

Subtask 4.3 — Non-Routine Analytical Services

EES has assumed the following analyses will be non-RAS (subcontract laboratory) analyses:

- SPLP
- TOC
- Hardness

EES has assumed that the PCB congener analysis and hexavalent chromium analyses will not be needed during the Phase I field activities of this project. However, it may be that, after Phase I data evaluation, additional non-RAS will be needed for analytes such as PCB congeners and hexavalent chromium. EES will discuss and follow EPA's decision on further non-RAS analyses for Phase II activities.

TASK 5 — ANALYTICAL SUPPORT AND DATA VALIDATION

This task provides for analytical support and data validation when required of samples collected under Task 3 or Task 4. EES will perform the following activities:

Subtask 5.1 — Collect, Prepare, and Ship Samples

EES will collect, prepare, and ship environmental samples in accordance with the approved QAPP. EES will provide sample management including chain-of-custody procedures, information management, sample retention, and 10-year data storage. EES assumes one P2 sample manager will be onsite each sampling day to prepare samples for shipment, enter sampling data into an electronic database, and prepare shipping documents and field activity summaries.

Subtask 5.2 — Sample Management

EES anticipates management activities to prepare subcontract laboratory SOWs during the Phase I and Phase II field activities.

EES will coordinate with the EPA Sample Management Office (SMO) and the Regional Sample Control Coordinator (RSCC) regarding analytical support, data validation, and QA issues.

EES will implement the EPA-approved laboratory QA program that provides oversight of in-house and subcontracted laboratories through periodic performance evaluation (PE) sample analyses and/or on-site audits of operations and has a system of corrective actions. PE samples and/or on-site audits will be required only in the event that corrective actions are implemented to verify that system changes have been properly implemented.

EES will develop DQOs for each sampling event; these DQOs will be the determining factor for assessing the success or failure of the sampling. EES assumes that this subtask will coincide with the DQOs established in the EPA-approved QAPP.

EES will provide 1 person during field sampling efforts to provide overall sample management, including chain-of-custody procedures, information management through Scribe, sample retention, sample packaging and labeling, sample trip reports, and shipping. EES anticipates that there will be enough samples collected daily to necessitate a field sample manager. This person will be accounted for under Subtask 5.2 and not under the field investigation (Task 3) tasks. These field sampling efforts include soil, groundwater, surface water, sediment, residential, and VI sampling during both Phase I and Phase II events.

Subtask 5.3 — Data Validation

EES will validate analytical data using the most current Region 2 Standard Operating Procedures for Data Validation and/or the EPA National Functional Guidelines (NFG). Data validation is the process by which the quality of the data, the defensibility of the data, and the chain of custody are verified. As indicated in the SOW, and further clarified in an email correspondence from EPA, samples that are analyzed through the EPA using EPA's laboratory, the CLP, or other lab services procured via Region 2

will be validated by EPA prior to release to EES (EPA 2012d). It is understood that there will be some form of data review and evaluation by EES for usability purposes related to project objectives.

EES anticipates conducting data reviews or validation for soil, vapor, air, sediment, surface water, and groundwater sample results. Specifically, an EES project chemist is required to conduct project-level data review on CLP (or other lab services procured via Region 2) on data validation packages.

For non-RAS analyses, an EES project chemist is required to conduct full data validation on sample delivery groups (SDG), as well as a data validation report preparation and review. EES will review the data analysis results against the validation criteria for intended purpose. EES will prepare and submit a Data Validation Report (DVR) to the RPM after the data are validated for each phase of the field investigation (Phase I and Phase II). EES anticipates that two DVRs will be generated.

TASK 6 — DATA EVALUATION

EES will organize and evaluate existing data and data gathered during the previous tasks to be used later in the RI/FS effort. Data evaluation begins with the receipt of analytical data from the data acquisition and the data validation tasks (Tasks 3 and 5) and ends with the submittal of the DESR. Specifically, EES will perform the data management and evaluation described in the Task 6 subtasks below.

Subtask 6.1 — Data Usability Evaluation

EES will evaluate the usability of historical and Phase I RI data, including any uncertainties associated with the data. An evaluation of the usability of the data using statistical methods, if selected, will be performed in accordance with *Data Quality Assessment: A Reviewer's Guide* EPA QA/G-9R EPA/240/B-06/002 (EPA 2006b). Section 5 of the UFP-QAPP Manual also provides information on what to include in the DESR.

Analytical data will be evaluated to assess whether project-required measurement performance criteria are achieved, and whether the data are usable to adequately address environmental questions (i.e., to establish whether regulatory or technical action limits have been exceeded) or to support project decision-making.

The evaluation of data usability will consider the following data quality indicators: precision, accuracy/bias, representativeness, comparability, completeness, and sensitivity. A data usability summary will be developed and incorporated into the DESR to address whether the available data are sufficient to adequately characterize the nature and extent of contamination in the environmental media of interest, identify potential contaminant migration pathways, and describe potential risks to human and ecological receptors.

Under this subtask, the following activities are anticipated:

- Assess usability of historical data (available groundwater, drinking water, soil, indoor air, etc.)
- Assess usability of Phase 1 geologic and hydrogeological data and information
- Assess usability of Phase 1 environmental media analytical data
- Assess usability of ecological assessments
- Develop written summaries for the DESR

Subtask 6.2 — Data Reduction, Tabulation, and Evaluation

In accordance with the SOW, EES will compile, tabulate, and evaluate data in appropriate presentation formats for final data tables. Both historical and current data collected as part of this WA will be entered into an environmental database, to be created as part of this subtask.

The following general guidelines will be used to prepare the environmental database and data for reports:

- Tables of analytical results will be organized in a logical manner, e.g., by sample location number, sampling zone, or some other logical format. Well identification numbers within each set may be ordered according to whatever alpha-numeric system is used for the well identification numbers. Surface/subsurface soil analyses will be separated according to site location or specific contaminant source and background areas. EES will coordinate data table organization with the EPA RPM.
- Sample location/well identification number will be used as the primary reference for the analytical results. The sample location number will also be indicated if the laboratory sample identification number is used.
- Analytical data tables will indicate the sample collection dates.
- The detection limit ("U" value) will be indicated in instances where a parameter was not detected.
- Analytical results will be reported in the text, tables, and figures using a consistent unit convention, such as µg/L for groundwater analyses and milligrams per kilogram (mg/kg) for soil analyses.
- EPA's protocol for eliminating field sample analytical results based on laboratory/field blank contamination results will be clearly explained.
- Discussion of approved sampling results will not be qualified by suggesting that a particular chemical is a common laboratory contaminant or was detected in the laboratory blank. If a reported result has passed QA/QC, it will be considered valid. In cases where the chemical in question is known to have been used and/or disposed of onsite, positively identified at high levels in other environmental media, and has passed QA/QC protocols, the sampling results will not be qualified as being due to laboratory contaminants.
- Field equipment rinsate blank analytical results will be discussed in detail, if decontamination fluid/solvents are believed to have contaminated field samples.

Relevant field data and measurements will be reduced and entered into electronic tables. Validated laboratory data and tabulated field data will be loaded into a project-specific database that will be designed and administered for the project.

EES will produce data summary tables for soil, groundwater, surface water, sediment, indoor air, and soil gas samples collected for field screening, on-site analyses, and laboratory analyses. As requested by EPA, the data sets will be exported into the EPA Region 2 Electronic Data Deliverable (EDD) formats. Other pertinent information collected for the RI/FS will be handled similarly. EES will prepare boring and well logs for subsurface explorations, and well-completion reports for constructed monitoring wells.

Relevant electronic Mansfield Site data will be linked in a geographic information system (GIS) that will be designed and administered for the project. The GIS will be used to produce spatial depictions of geologic, hydrogeological, and analytical data in the geologic and hydrogeological data evaluation described below, as well as in future project planning and stakeholder correspondence.

Under the direction and review of an experienced geologist, EES will:

- Interpret geologic boring and monitoring well logs;
- Reduce and interpret geophysical results to evaluate the locations, attitudes, and flow regimes of bedrock fractures;
- Reduce and interpret overburden and bedrock groundwater elevation measurements to produce estimated bedrock and overburden potentiometric surface maps of the Mansfield Site; and
- Reduce and interpret vapor, soil, groundwater, and waste debris analytical results to assess the nature and distribution of contaminants within the Mansfield Site.

A geologist or geophysicist will reduce and interpret geophysical results to evaluate the locations, attitudes, and flow regimes of bedrock fractures. A hydrogeologist will reduce and interpret overburden and bedrock groundwater elevation measurements to produce estimated bedrock and overburden potentiometric surface maps of the study area.

A hydrogeologist will interpret geologic boring and monitoring well logs. The technical staff will reduce and interpret vapor, air, soil, groundwater, surface water, sediment, tap water, indoor air, and soil gas analytical results to assess the nature and distribution of Mansfield Site contaminants within the study area. The combined geologic, hydrologic, geophysical, and chemical data will be used to develop a preliminary CSM to describe the nature and extent of contamination and potential mechanisms for contaminant migration within the study area.

Two major activities are anticipated to be performed under this subtask, including: (1) preparation and export of EDDs in accordance with EPA Region 2 requirements and guidance (as presented at http://www.epa.gov/region02/superfund/medd.htm), and (2) compiling and developing data outputs (database queries, tables, figures, etc.) and evaluating the analytical data and field results.

Preparation of EDDs:
Preparation of EDDs is anticipated to entail the following:

- Historical data preparation – As discussed during the June 27, 2012 project scoping meeting, EES assumes that minimal effort will be needed to convert available historical data into the Region 2 EDD-compliant format. EES assumes that historical data are available in electronic format that can be manipulated (e.g., spreadsheet, text file, database file), as well as optically scanned images (e.g., .pdf). EES will evaluate existing well logs; well completion reports (3 monitoring wells, 18 residential wells); soil, groundwater, and waste data collected for the HRS and IAS; NJDEP residential tap-water data, and indoor air and sub-slab sampling data.
- Historical data checking – After analytical data and field measurements and information have been entered into the Region 2 EDD templates, the data entries will be checked using the specified Electronic Data Processor (EDP) and corrected, as needed. After the historical data entry step is completed, the EDDs will be submitted to EPA Region 2.

Should the level of effort necessary be greater than assumed, EES will notify EPA to establish the appropriate course of action.

- Addition of **Phase I** field information – Field observations and measurements will be incorporated into the Region 2 EDDs with validated analytical results for subsequent delivery to EPA for integration into EPA's database. The LOE is anticipated to include the following:

    1. Entry of field information for 70 MIP borings, 20 soil borings, 10 background soil borings, 200 field PID/ECD and 400 XRF screening sample locations; 50 sediment sample locations, 17 indoor air sample locations, and 17 sub-slab sample locations.
    2. Entry of field information for 2 rock coring logs, 8 bedrock well logs, 10 overburden well logs, 8 multi-level well completion reports, and 10 overburden well completion reports.
    3. Entry of field information for 61 groundwater samples (8 multi-level wells, 6 levels each, 10 overburden monitoring wells, and 3 single-level monitoring wells), 18 residential samples, and 50 surface water samples.
    4. Entry of field information for 1 synoptic round of water levels and stream gauge information.
    5. After entries are completed, the EDDs will be checked and reviewed using the Earthsoft EDP, and corrected in accordance with Region 2 EDD requirements. It is anticipated, during Phase I, that EDDs will be provided in 12 submittals.

- Addition of **Phase II** field information – The LOE is anticipated to include the following:

  1. Entry of field information for 10 soil borings (20 samples) and 10 sediment samples.
  2. Entry of field information for 4 multi-level well logs and 4 multi-well completion reports.
  3. Entry of field information for 85 groundwater samples (12 multi-level wells, 6 levels each, 10 overburden monitoring wells, and 3 single-level monitoring wells), 18 residential samples, and 10 surface water samples.
  4. Entry of field information for 1 synoptic round of water levels and stream gauge information.
  5. After Phase II entries are completed, the EDDs will be checked and reviewed using EDP, and corrected. It is anticipated, during Phase II, that EDDs will be provided in 3 submittals.

Data Reduction, Tabulation, and Evaluation:
Data reduction, tabulation, evaluation are anticipated to entail preparation of database queries, conceptualization and development of data tables, summary statistics, and figures, and interpretation of the compiled information. These activities will be performed for Phase I and Phase II investigation results.

- Activities to be performed for **Phase I** data compilation, reduction, and evaluation / interpretations are expected to include:

Phase I **Data / Information**	**Activities** **(Compilation, Tabulation & Evaluation/Interpretation)**
Overburden Geology	
Soil lithology	Prepare 45 electronic soil boring logs, 3 cross-sections, 2 tables
Overburden Hydrogeology	
Overburden hydrogeology	Prepare 1 water table map, tabulate water level & monitoring well information
Bedrock Geology	
Air-Rotary Logs	Prepare air-rotary logs for 8 boreholes (between 100' and 400' each)
Geologic Cross-Sections	Prepare 3 bedrock geologic cross-sections
Bedrock Core Logs	Prepare 2 bedrock core logs (assume one at 400' and one at 600')
Bedrock Hydrogeology	
Downhole Hydraulic Conductivity	Prepare logs for 8 boreholes
Borehole Geophysical Log Interpretation	Interpret logs for 10 boreholes, between 100' and 400' each
HPFM (Intra-well, static and non-static)	Interpret HPFM data for 8 boreholes, between 100' and 400' each
HPFM (Inter-well non-static)	Interpret HPFM data for 8 boreholes, 60 tests total, includes 4 cross-sections
Packer Sampling Zone Selection	Evaluate and select packer sampling zones (10 boreholes) and prepare rapid review memo)

Phase I **Data / Information**	**Activities** **(Compilation, Tabulation & Evaluation/Interpretation)**
Packer Sampling Specific Capacity Test Data	Compile and review packer sampling specific capacity test data (10 boreholes)
Matrix Diffusion Sampling Data	Compile and review matrix diffusion sampling data (2 cores, 25 samples each)
Multi-Level Well Design	Prepare multi-level well design (8 total wells)
Pumping Test Data Evaluation	Evaluate pumping test data (6 well, multi-day step drawdown)
Vertical Gradient Evaluation	Compile data, develop figures, evaluate vertical gradient (overburden, shallow, mid, and deep bedrock)
Potentiometric Surfaces	Prepare 3 bedrock potentiometric surfaces (one round each in shallow, mid-, and deep bedrock)
Analytical Results	
Soil VOCs and metals screening data	Run 1 query, tabulate data, prepare 2 figures (VOCs & metals)
Soil VOCs, SVOCs, PCBs, pesticides, and metals data	Run 5 queries, tabulate data, prepare action-level tables, prepare 4 figures (VOCs, SVOCs, pesticides, PCBs & metals) all showing data which exceed regulatory standards
Overburden & Bedrock Groundwater VOCs, SVOCs, PCBs, pesticides, and metals data	Run 10 queries, tabulate data, prepare action-level tables and 8 figures (VOCs, SVOCs, pesticides, PCBs, and metals) showing data which exceed regulatory standards
Residential VOCs, SVOCs, PCBs, pesticides, and metals data	Run 5 queries, tabulate data, prepare action-level tables and prepare 4 figures (VOCs, SVOCs, pesticides/PCBs & metals) showing data which exceed regulatory standards
Surface water VOCs, SVOCs, PCBs, pesticides, and metals data	Run 5 queries, tabulate data, prepare action-level tables and prepare 2 figures (VOCs, SVOCs, pesticides/PCBs & metals) showing data which exceed regulatory standards
Sediment VOCs, SVOCs, PCBs, pesticides, and metals data	Run 5 queries, tabulate data, prepare action-level tables and prepare 2 figures (VOCs, SVOCs, pesticides/PCBs & metals) showing data which exceed regulatory standards
Indoor air and sub-slab VOCs data	Run 1 query, tabulate data, prepare action-level exceedance tables, prepare 1 figures (VOCs indoor & sub-slab)
Soil TCLP and SPLP data	Run 1 query, tabulate data, prepare action-level tables with data that exceed regulatory standards, prepare 1 figure (TCLP, SPLP)

- Activities to be performed for **Phase II** data compilation, reduction and evaluation/interpretations are expected to include:

Phase II **Data / Information**	**Activities** **(Compilation, Tabulation & Evaluation/Interpretation)**
Overburden Geology	
Soil lithology	Prepare 10 electronic soil boring logs, 3 cross-sections, 2 tables & interpret results
Overburden Hydrogeology	
Overburden hydrogeology	Prepare 1 water table map, tabulate water level & wells info
Bedrock Geology	
Air-rotary Logs	Prepare air-rotary logs for 4 boreholes - assume between 400 and 600' each
Geologic Cross-Sections	Prepare 3 bedrock geologic cross-sections
Bedrock Hydrogeology	
Downhole Hydraulic Conductivity	Prepare logs for 4 boreholes
Borehole Geophysical Log Interpretation	Interpret logs for 4 boreholes, between 400' and 600' each
HPFM (Intra-well, static and non-static)	Interpret data for 4 boreholes, between 400' and 600' each
HPFM (Inter-well, non-static)	Interpret data for 4 boreholes, 16 tests total, includes 2 flow cross-sections
Packer Sampling Zone Selection	Evaluate data, select sampling zones for 4 boreholes, prepare rapid review memo
Packer Sampling Specific Capacity Test Data	Evaluate packer sampling specific capacity test data (12 boreholes)
Multi-Level Well Design	Evaluate data, and develop Multi-Level Well design (4 total wells)
Pumping Test Data Evaluation	Evaluate pumping test data (3 well, multi-day step drawdown)
Vertical Gradient Evaluation	Compile data, develop figures, evaluate vertical gradient (overburden, shallow, mid-, and deep bedrock)
Potentiometric Surfaces	Prepare 3 bedrock potentiometric surfaces (one round each in shallow, mid-, and deep bedrock)
Analytical Results	
Soil VOCs and metals screening data	Run 1 query, tabulate data, prepare 2 figures (VOCs and metals)
Soil VOCs, SVOCs, PCBs, pesticides, and metals data	Run 5 queries, tabulate data, prepare action-level tables and 4 figures (VOCs, SVOCs, pesticides, PCBs, and metals) showing data which exceed regulatory standards

Phase II **Data / Information**	**Activities** **(Compilation, Tabulation & Evaluation/Interpretation)**
Overburden & Bedrock Groundwater VOCs, SVOCs, PCBs, pesticides, and metals data	Run 10 queries, tabulate data, prepare action-level tables and prepare 8 figures (VOCs, SVOCs, pesticides, PCBs, and 3 metals) showing data which exceed regulatory standards
Residential VOCs, SVOCs, PCBs, pesticides, and metals data	Run 5 queries, tabulate data, prepare action-level tables and prepare 4 figures (VOCs, SVOCs, pesticides, PCBs, and metals) showing data which exceed regulatory standards
Surface water VOCs, SVOCs, PCBs, pesticides, and metals data	Run 5 queries, tabulate data, prepare action-level exceedance tables, prepare 2 figures (VOCs, SVOCs, pesticides, PCBs, and metals) showing data which exceed regulatory standards
Sediment VOCs, SVOCs, PCBs, pesticides, and metals data	Run 5 queries, tabulate data, prepare action-level tables and prepare 2 figures (VOCs, SVOCs, pesticides, PCBs, and metals) showing data which exceed regulatory standards
Soil TCLP and SPLP data	Run 1 query, tabulate data, prepare action-level tables showing data which exceed regulatory standards, prepare 1 figure (TCLP, SPLP)

Subtask 6.3 — Modeling

Based on its review of the DESR to be submitted under Task 6.4, EPA will establish whether groundwater modeling will be conducted for this RI/FS, and will direct EES to perform a modeling effort, if required.

As discussed during the June 27, 2012 project scoping meeting, EES will not proceed with the modeling effort until formally directed to do so by EPA. However, as part of the work plan budget, EES has been requested to include a technical outline for an initial modeling assessment and for the preparation of a work plan and budget addendum describing the scope and technical approach for performance of a full modeling effort.

The activities to be performed under Subtask 6.3, once authorized by EPA, will include:

Selection of Modeling Approach

- Evaluation of compiled geologic, hydrogeological, and contaminant data
- Identification of modeling objectives and complexity (1D, 2D, or 3D flow)
- Determination of transient or steady-state hydrogeological flow regime considerations
- Selection of hydraulic or solute transport modeling requirements
- Identification of boundary conditions and surface water discharges
- Evaluation of aquifer geometry
- Selection of modeling method (numerical vs. analytical)

Meeting to Discuss Groundwater Modeling Approach
Meeting or conference call with EPA to discuss initial assessment and recommendations.

In the event that EPA establishes that performance of the modeling effort is necessary, EPA will generate a revised SOW. Subsequently, EES will provide a revised work plan and cost estimate based on the revised SOW.

Subtask 6.4 — Data Evaluation Summary Report

At the completion of Phase I of the RI sampling program, EES will prepare and submit a Phase I DESR. The DESR will summarize the results of the Phase I field investigation program and identify data gaps remaining with regard to the objectives of the RI/FS. The document will summarize the sample results, and will include a discussion of the analytical results and any discrepancies, including discussions of the quality and usability relative to project DQOs.

The information presented in the Phase I DESR will be used as the basis for scoping any necessary Phase II field investigation activities that will be described in the QAPP addendum (see Subtask 1.7). There will be no Phase II DESR; these data will be combined with the Phase I data and evaluated in the Draft RI Report (Task 9). Under Subtask 6.4, written narratives will be developed for the Phase I data compiled, tabulated, and evaluated under Subtask 6.2. EES anticipates that the Phase I DESR will include:

- 7 sections of text
    - Section 1.0 Introduction
    - Section 2.0 Site Description and History – summarizes Mansfield Site history and previous investigations
    - Section 3.0 Phase I Investigations – summarizes the Phase I RI activities
    - Section 4.0 Geology and Hydrogeology – provides the updated geological and hydrogeological assessments
    - Section 5.0 Nature and Extent of Contamination – provides descriptions of chemicals detected in environmental media
    - Section 6.0 Fate and Transport – presents a preliminary assessment of contaminant migration and transformation at and downgradient of the known and probable source areas
    - Section 7.0 Conclusions and Recommendations – summarizes key Phase I findings and identifies data gaps and proposed Phase II investigations
- 10 additional figures (Mansfield Site locus, topography, features, etc.) to conceptualize, draft, and finalize
- 10 additional tables (summaries of Mansfield Site information, sample inventories, well inventories, etc.)
- Three-tiered review

TASK 7 — RISK ASSESSMENT

EES will prepare a Risk Assessment to evaluate whether Mansfield Site contaminants pose a current or potential risk to human health and the environment in the absence of any remedial action. EES will address the contaminant identification, exposure assessment, toxicity assessment, and risk characterization. EES will submit a Risk Assessment Report that will be used to evaluate whether remediation is necessary at the Mansfield Site, provide justification for performing remedial action, and evaluate for which exposure pathways remediation is warranted. EES will perform an HHRA and initiate

the 8-Step ERA process with the completion of a SLERA. Subtasks 7.1 and 7.2 describe the proposed approaches for completing the HHRA and SLERA, respectively.

Subtask 7.1 — Baseline Risk Assessment – Human Health

EPA tasked EES to prepare an HHRA for the Mansfield Site. The primary objective of the HHRA is to investigate whether Mansfield Site contaminants pose a current or potential risk to human health in the absence of remediation. The HHRA will be used to evaluate whether remediation is necessary at the Mansfield Site, provide justification for performing remedial action, and (if so) evaluate which exposure pathway(s) need(s) to be remediated.

The approach to be used for the baseline HHRA for the Mansfield Trail Dump Site will be developed consistent with EPA's *Risk Assessment Guidance for Superfund (RAGS) Parts A, D, E, and F* (EPA 1989, 2001, 2004, 2009). Conservative assumptions will be used to assess potential risks associated with current and future land use scenarios. Potential soil, surface water, sediment, groundwater, groundwater seep, and vapor intrusion exposures will be addressed in the HHRA.

The baseline HHRA consists of a four-step evaluation process with the following components:

- **Data Evaluation —** Summarizes the data by medium and discusses the data screening process used to identify COPCs.
- **Exposure Assessment —** Identifies the potential receptor populations and exposure pathways.
- **Toxicity Assessment —** Provides methods for the toxicity assessment of COPCs.
- **Risk Characterization —** Provides hazard and risk characterization methods to estimate potential human health exposures, including an uncertainty assessment identifying sources of uncertainty in the risk estimates.

Data Evaluation and Identification of COPCs

Soil, surface water, sediment, and groundwater data collected during the Phase I and Phase II RI will comprise the data set for the HHRA. Due to ongoing indoor air studies being conducted by EPA in the Residential Investigation Area, the VI pathway will be addressed only qualitatively in the HHRA; sub-slab gas and indoor air data will not be evaluated quantitatively in the HHRA. In addition, due to the expected small size of seeps in the residential area and low concentrations expected, the groundwater-seep exposure pathway will be addressed qualitatively in the HHRA; seep data will be not be evaluated quantitatively in the HHRA. Soil, surface water, sediment, and groundwater will be addressed in the HHRA as follows:

- Soil samples collected from discrete depths between 0 and 10 feet bgs will be used in the HHRA. Soil from 0 to 2 feet bgs will be used to evaluate current scenarios. Because future uncontrolled invasive activities may disturb soil in the shallow subsurface (0 to 10 feet bgs) and bring current subsurface soil to the ground surface where contact may occur, soil from the 0- to 10-foot interval will be used to evaluate future scenarios. Soil at Dump Areas A, B, C, D, and E will be evaluated separately.
- Sediment and surface water samples collected from Lubbers Run and its tributary will be used in the HHRA. Sediment and surface water samples will be used to evaluate current/future scenarios for direct contact in the water bodies. The onsite tributary and off-site Lubbers Run will be evaluated separately.
- Sediment and surface water samples collected from Lubbers Run will be used to estimate contaminant concentrations in fish. Ingestion of fish will be evaluated in the HHRA for current / future scenarios. It is assumed that the on-site tributary is too small to support edible-sized fish.

- Groundwater samples collected from tap water at residences with domestic wells during Phases I and II of the RI will be used to evaluate current potable groundwater use in the Residential Investigation Area. Each residence will be evaluated separately.
- Groundwater samples collected from monitoring wells on the east side of the groundwater divide during Phases I and II of the RI will be used to evaluate future potable groundwater use in off-site properties to the east (Residential Investigation Area). Groundwater from monitoring wells on the east side of the groundwater divide will be pooled and evaluated as one data set.

COPCs are those contaminants that have the greatest potential to cause adverse human health effects if receptors come into contact with site media. The risk-based screening levels will be identified in the PAR for soil, sediment, surface water, and groundwater, and will be based on the EPA Regional Screening Levels (RSLs).

Exposure Assessment and Preliminary Conceptual Exposure Model

"Exposure" refers to contact by a receptor with a chemical. The exposure assessment identifies pathways and routes by which an individual may be exposed and estimates potential exposure. EPA's risk assessment guidelines state that risks are estimated only for potentially complete pathways.

Potential Receptors

The five Dump Areas are located in an undeveloped, wooded area adjacent to a residential neighborhood. A public pedestrian and bicycle path run north-south along the east side of Dump Areas C, D, and E. There is currently no fencing or other measure present that could prevent access to the Source Areas Investigation Area by the public, and trespassers have been observed using a network of wooded trails near Dump Area B for off-road motorcycles. In addition, pedestrians, bikers, and joggers have been observed on the bike path and in the vicinity of Dump Areas B, D, and E, and the area is accessed as a short-cut from the residential area to the nearby high school. Further, the power line ROW in the Source Areas Investigation Area is maintained (i.e., mowed on a regular basis), and a portion of the ROW crosses Dump Area D. The Source Areas Investigation Area is bordered to the east by a steep, narrow valley. An abandoned railroad bed and ROW and a divided stream that flows north on both sides of the ROW are located on the valley floor. The stream flows to Lubbers Run and the Musconetcong River, which are both used for recreation, including fishing, boating, and hiking.

Potential current receptors are trespassers (at the Dump Areas; currently assumed to be children, adolescents, and adults), recreational users and fish consumers (at Lubbers Run and the Musconetcong River; currently assumed to be children and adults), and residents in the residential area to the northwest of the Dump Areas. Future land use at the Dump Areas is expected to remain unchanged (i.e., it will remain undeveloped). Potential future receptors are the same as the current receptors, with the addition of construction workers performing uncontrolled excavation activities at the Dump Areas.

Exposure Scenarios to Be Quantified

- **Soil.** Potential current soil exposures for each Dump Area will be quantified in the HHRA for incidental ingestion, inhalation of volatile emissions and dust in ambient air, and dermal contact with soil/dust by trespassers (child, adolescent, and adult) if COPCs are identified in surface soil (0–2 ft bgs). Potential future soil exposures will be quantified for incidental ingestion, inhalation of volatile emissions and dust in ambient air, and dermal contact with soil/dust by construction workers and trespassers (child, adolescent, and adult) if COPCs are identified in total soil (0-10 ft bgs). Although the power line ROW in the Source Areas Investigation Area is maintained, it is assumed that no soil COPCs will be identified in the ROW within Dump Area D, since the area was historically excavated to bedrock.

- **Surface Water and Sediment**. Potential current and future exposures to surface water and/or sediment in Lubbers Run and the unnamed tributary will be quantified in the HHRA for incidental ingestion and dermal contact by recreational users (adult and child) if COPCs are identified in surface water and/or sediment.
- **Fish.** Potential current and future exposures via ingestion of fish caught in Lubbers Run will be quantified in the HHRA for fish consumers (adult and child) if COPCs are identified for fish ingestion.
- **Groundwater.** Potential current exposures to groundwater will be quantified in the HHRA for ingestion, dermal contact, and inhalation of VOCs while bathing/showering by residents if COPCs are identified in drinking water collected from domestic wells. Potential future exposures to groundwater will be quantified in the HHRA for ingestion, dermal contact, and inhalation of VOCs while bathing/showering by residents if COPCs are identified in groundwater collected from monitoring wells.

Exposure Point Concentrations
Measured exposure point concentrations (EPCs) will be used to quantify potential exposures to soil, surface water, sediment, and groundwater. However, soil concentrations will be used to model EPCs for volatile constituents and dusts in ambient air. Groundwater concentrations will be used to model EPCs for volatile constituents in bathroom/shower air, and surface water and/or sediment concentrations will be used to model EPCs in fish tissue.

For soil, groundwater, surface water, and sediment COPCs, EPCs will be estimated following the most recent parametric (distributional) and nonparametric EPA recommendations in the most current version of ProUCL (currently Version 4.1.01 [EPA 2011]). ProUCL provides approaches for calculating upper confidence limits (UCLs) of the mean, particularly when non-detect results are present. If fewer than eight results are available for a COPC in an exposure unit/medium, the maximum detected concentration will be used as the EPC for that COPC.

Exposure Factors
Where available, EPA default exposure factors for reasonable maximum exposure (RME) scenarios will be used to estimate intakes from soil, groundwater, air, surface water, sediment, and fish tissue exposures. When default values are unavailable, best professional judgment will be used.

Toxicity Assessment
The toxicity assessment identifies the toxicity values for the COPCs used in the estimation of potential health effects. Health effects are divided into two broad groups: noncarcinogenic and carcinogenic effects. EPA's recommended tiered approach will be used to obtain the toxicity values (EPA 2003).

Risk Characterization
The objective of the risk characterization is to integrate the information developed in the exposure assessment and the toxicity assessment into an evaluation of both the potential noncancer health effects and the cancer risks associated with COPCs. Excess lifetime cancer risks (ELCR) and non-cancer hazard indices (HI) will be calculated for each receptor group and applicable exposure scenario.

Hazard quotients will be summed across applicable exposure routes by primary target organ to yield target organ HIs for each potential receptor group. The target organ HIs for each receptor group will be compared with EPA's target level of 1.0.

The ELCR will be estimated for each receptor group by summing corresponding ELCRs, similar to the approach described above for HIs. The total estimated ELCR for each receptor group will be compared with EPA's target range for ELCRs, which is from 1 in 10,000 (1×10^{-4}) to 1 in 1 million (1×10^{-6}).

If risk estimates exceed EPA targets, and background data are available for a COPC that is a risk driver, Mansfield Site concentrations will be compared with background levels for that COPC. If Mansfield Site concentrations are within background levels, the risk estimate attributable to background will be presented separately from the risk estimates potentially attributable to historic Mansfield Site activities.

The COPCs that are risk drivers (causing EPA's target risk levels to be exceeded) and above background levels will be identified as contaminants of concern (COCs) for the Feasibility Study.

An uncertainty assessment will be included as part of the risk characterization. The uncertainty assessment will present the major uncertainties associated with each major component of the HHRA (that is, data evaluation, exposure assessment, toxicity assessment, and risk characterization). If RME risk estimates (excluding COPCs within background levels) for a receptor group exceed EPA target risk levels, CTE risk estimates will be calculated for the receptor group using CTE exposure factors approved by EPA. The appropriate CTE exposure factors for the exposure scenario(s) of interest will be discussed with, and approved by, EPA prior to their use in the HHRA. At this time, it is assumed that CTE estimates will be required for one receptor and two data groupings (e.g., future construction worker at two dump areas).

Draft and Final HHRA Appendices

A draft HHRA document will be prepared as an appendix to the RI Report. The draft document will be submitted to EPA for review and comment. Upon submittal of the draft RI Report, an in-person presentation will be made by EES's risk assessor to EPA to present the detailed approach and results of the HHRA and answer questions from EPA's HH risk assessor, and discuss interpretation of the risk estimates and chemicals of concern, if any. This step will facilitate and streamline EPA's review of the PAR.

It is assumed that subsequent comments on the draft HHRA appendix will be received from EPA in writing, and that written responses to comments will be required. After resolution of the comments / responses, the draft HHRA appendix will be revised and, subsequently, the final HHRA appendix will be prepared.

Subtask 7.2 — Ecological Risk Assessment

EPA has tasked EES with preparing a SLERA for the Mansfield Site to evaluate the risk to the environment posed by site contaminants. The SLERA completes the first two steps of the 8-Step ERA process described in EPA's *Ecological Risk Assessment Guidance for Superfund, Process for Designing and Conducting Ecological Risk Assessments* (EPA 1997). The objective of the SLERA is to characterize ecological risk based on conservative scenarios and assumptions and assess whether the ERA can be terminated at the completion of Step 2, or if a full BERA (Steps 3 through 7) is required.

The following section provides an estimate for completing the SLERA (Steps 1 and 2 of the ERA) only, and does not estimate costs for completing a BERA (Steps 3 through 7). Conduct of a BERA is dependent on the outcome of the SLERA, and until the SLERA is completed, it cannot be established whether a BERA is necessary, what receptor/exposure pathway combinations would be evaluated in the BERA, and/or the types of site investigations or evaluations that would be necessary to fully characterize risk. The SLERA will be conducted immediately following completion of the Phase I investigation. It is assumed that adequate soil, sediment, surface water, and groundwater data will be collected during the

Phase I investigation to complete the SLERA and establish whether a BERA is necessary for the Mansfield Site, or if the ERA process can be exited following completion of the SLERA. The following estimate incorporates a full interpretation and evaluation of the SLERA outcome, which will provide the information necessary to make risk-management decisions about the need for continued Mansfield Site investigation and evaluation.

The SLERA will be completed in accordance with current Superfund ecological risk assessment guidance *(Ecological Risk Assessment Guidance for Superfund, Process for Designing and Conducting Ecological Risk Assessments [ERAGS]*, [EPA 1997]). The approach and assumptions for this SLERA are described in detail as part of the PAR (Subtask 1.13), to obtain EPA concurrence prior to completion of the SLERA.

The draft SLERA will include completion of the tasks described in the following sections. Relevant information already developed for the PAR (e.g., problem formulation, toxicity reference values) will be included within the SLERA.

Screening-Level Problem Formulation
The screening-level problem formulation will characterize the environmental site setting and develop the preliminary CSM. The environmental setting discussion will include characterization of relevant background site information and on-site habitats and biota. Wetland habitats, if present (based on a National Wetland Inventory and state wetland map evaluation), will be identified and the possible presence of Endangered, Threatened, and Other Species of Special Concern (based on an evaluation of applicable online natural heritage databases) will be documented as part of the habitat and biota characterization.

The preliminary CSM will include the following:

- Hazard (Source) Identification – Available site information about the hazardous substances present at the Mansfield Site and the major COCs (based on historic site activities).
- Chemical Dose-Response and Fate-and-Transport Assessment – Potential COCs will be characterized based on both their toxicological properties and fate-and-transport characteristics.
- Characterization of Mansfield Site and Potential Receptors – Environmental exposure pathways will be selected for evaluation based on consideration of the biota and potential exposure pathways present at the Mansfield Site.
- Chemicals, Indicator Species, and End Points for Evaluation – Representative chemicals, indicator species (species that are especially sensitive to environmental contaminants), and assessment and measurement endpoints will be evaluated as the final step of the preliminary CSM.

Exposure Assessment
The exposure assessment will identify the potential magnitude of environmental exposures, the frequency and duration of these exposures, and the routes by which ecological receptors are exposed. The exposure assessment will include a qualitative evaluation of the likelihood of such exposures and provide a basis for the development of acceptable exposure levels.

Although the exposure pathways and receptors identified for evaluation will depend on the outcome of the problem formulation, available site information indicates that the SLERA will include the evaluation of the direct exposure of lower trophic-level organisms to chemicals in abiotic media, and the evaluation of the indirect exposure of wildlife to chemicals that may have accumulated in the food web. It is anticipated that up to three direct exposure pathway / receptor combinations will be evaluated, consisting of the following:

- Terrestrial plant/soil invertebrate exposure to chemicals in surface soil
- Benthic invertebrate exposure to chemicals in sediment
- Aquatic life exposure to chemicals in surface water

Final media data groupings for the evaluation of the direct exposure pathways will be assessed with the EPA as part of the PAR evaluation (Subtask 1.13), but it is likely that surface soil chemical analytical data will be grouped by Dump Area (up to 5 data groupings) for evaluation, while surface water and sediment will be maintained as single data groupings (by media) for analysis.

Literature-based food-web models will be used to estimate the potential exposure of wildlife to chemicals from the ingestion of prey that may have bioaccumulated chemicals in terrestrial and aquatic food webs, from the ingestion of plant material (as applicable), from the ingestion of surface water as a source of drinking water, and from the incidental ingestion of soils or sediments. Data groupings for wildlife will be established with the EPA as part of the PAR evaluation (Subtask 1.13) but, based on the habitats present, it is anticipated that up to eight wildlife receptor / exposure pathway combinations will need to be evaluated to account for the avian and mammalian exposure pathways potentially occurring at different trophic levels (herbivore/granivores, soil invertebrate predators, higher trophic-level predators, aquatic insectivores, and aquatic piscivores) at the Mansfield Site. Depending on the characteristics of the wildlife species (e.g., foraging ranges, habitats used) and the distribution of the habitats and chemicals associated with each Dump Area, it may be necessary to group chemical analytical data by Dump Area (up to 5 data groupings) for evaluation of the wildlife exposure pathways. The evaluation of risks to wildlife via the food web will focus on the evaluation of potentially bioaccumulative chemicals identified in Table 4-2 of *Bioaccumulation Testing and Interpretation for the Purpose of Sediment Quality Assessment Status and Needs* (EPA 2000).

Although there are no direct exposure pathways for ecological receptors to chemicals in groundwater, there is the potential for ecological receptor exposure if chemicals in groundwater should discharge to surface water. Accordingly, chemical concentrations in groundwater will be screened in the SLERA to assess whether they could represent a potential risk to aquatic life if that groundwater discharges to surface water in the future.

Consistent with the conservative approach established for the SLERA (EPA 1997), exposure will be estimated using the reasonable maximum chemical concentrations detected for each of the media / area data groupings. The estimated budget assumes that only data collected during the current RI will be quantitatively evaluated in the SLERA.

Toxicity and Ecological Effects Assessment

The toxicity and ecological effects assessment will address the types of adverse environmental effects associated with each chemical exposure, the relationships between the magnitude of exposure and adverse effects, and the related uncertainties associated with contaminant toxicity.

The maximum detected concentration within a media data grouping (direct exposure pathway/receptor evaluation) and the maximum estimated dose (indirect exposure pathways for wildlife) will be compared to literature-based toxicity reference values (TRVs). A hazard quotient, which is the ratio of the exposure concentration/dose to the TRV, will be calculated for each chemical and data grouping.

TRVs for the SLERA will be derived from existing literature databases and sources. For the direct exposure pathway/receptor evaluation, the maximum detected concentrations in a medium data grouping will be directly compared to concentration-based TRVs while, for the wildlife exposure pathways, the estimated wildlife doses will be compared to dose-based TRVs. TRVs and/or the literature sources of the

TRVs to be used in the SLERA will be presented in the PAR (Subtask 1.13) for EPA review and approval prior to inclusion in the SLERA.

Identification of Limitations and Uncertainties
Critical assumptions and uncertainties associated with the SLERA and their direction and magnitude of impact on the outcome and conclusions of the SLERA will be identified and evaluated.

Conceptual Site Model Refinement and Risk Management Evaluation and Recommendations
The CSM, which was first established in the problem formulation, will be refined with the completion of the SLERA (Step 2 of the ERA), which is the final ERA process included in this work plan. Based on the outcome of the SLERA, and the uncertainties identified during the SLERA evaluation, recommendations will be presented about the need for additional investigation and/or ecological risk evaluation at the Mansfield Site. Additional site-specific screening steps are likely to be incorporated as a part of this evaluation. The specific analyses to be included for this evaluation will depend on the outcome of the SLERA, but will likely include the consideration of reference chemical concentrations, chemical distribution, and the magnitude of concentrations of COCs in excess of relevant TRVs, if reported. The evaluation and recommendations provided in this section can be used by risk managers to assess whether the ERA process can be exited following completion of the SLERA (Step 2), or if the ERA should continue to the first step of the BERA. If additional investigation is warranted, specific input will be provided about the receptors and exposure pathways warranting further investigation and recommended methods for this evaluation.

Final Screening Level Ecological Risk Assessment Report
Following review of the draft SLERA by EPA, EES will respond to comments and revise the SLERA to produce a final document. It is assumed that EES will respond in writing to one round of written comments from the EPA and that conference calls will be needed to resolve comments. The comments are assumed to be minor to moderate in scope based upon ongoing communication between the EPA and the EES project team during the project process (e.g., during the PAR). The estimated budget assumes incorporation of revisions into the final SLERA report.

Meetings and Conference Calls
The ecological risk assessor will participate in progress and special topic meetings (via conference calls) during the course of the RI/FS.

TASK 8 — TREATABILITY STUDY / PILOT TESTING – NOT APPLICABLE

TASK 9 — REMEDIAL INVESTIGATION REPORT

EES will prepare the RI Report in accordance with Guidance for *Conducting Remedial Investigations/Feasibility Studies under CERCLA*, OSWER Directive 9355.3-01, October 1988, Interim Final (or latest revision) and *Guidance for Data Usability in Risk Assessment* (EPA/540/G-90/008), October 1990 (or latest revision).

Subtask 9.1 — Draft RI Report

EES will submit a Draft RI Report that will include the following main items as included in the SOW. Depending on field results, other items may be added or elaborated upon within the listed items below. Additionally, EES anticipates creating a formal RI Report Outline for EPA review, comment, and consensus, after Phase II activities are completed.

1) Executive Summary
2) Introduction

a) Purpose of the Report
b) Mansfield Site Background
    i) Mansfield Site Description·
    ii) Mansfield Site History
    iii) Previous Investigations
    iv) Previous Emergency or Interim Actions
    v) Report Organization

3) Study Area Investigation
a) Includes field activities associated with site characterization, including, as appropriate, physical and chemical monitoring of the following:
    i) Surface Features (e.g.; topographic mapping, natural and manmade features)
    ii) Contaminant Source Investigations
    iii) Meteorological Investigations
    iv) Surface Water and Sediment Investigations
    v) Geological Investigations
    vi) Soil and Vadose Zone Investigations
    vii) Groundwater Investigations
    viii) Groundwater-Surface Water Interactions
    ix) Human Populations Surveys
    x) Ecological Investigations
    xi) Vapor intrusion sampling (indoor air and sub-slab soil gas)
b) If TM documenting field activities are prepared, they may be included in an appendix and summarized in this report chapter.

4) Physical Characteristics of the Study Area
a) Includes the results of field activities to assess physical characteristics, including, as appropriate, the following:
    i) Surface Features
    ii) Meteorology
    iii) Surface water hydrology
    iv) Geology
    v) Soils
    vi) Hydrogeology
    vii) Demography and Land use
    viii) Ecology

5) Nature and Extent of Contamination – Screening values used to assess nature and extent will be agreed to by EPA before issuing the draft RI.
a) Presents the results of Mansfield Site characterization, both natural and chemical components and contaminants, as appropriate, in the following media:
    i) Sources (lagoons, sludges, tanks – could have multiple sources in multiple matrices)
    ii) Soils and Vadose Zone (Overburden)
    iii) Groundwater
    iv) Bedrock
    iv) Subsurface Gases
    v) Surface Water and Sediments
    vi) Air

6) Contaminant Fate and Transport
a) Potential Routes of Migration (e.g. air, groundwater, soils)
b) Contaminant Characteristics
    i) As applicable, describe estimated persistence in the study area environment and physical, chemical, and/or biological factors of importance for the media of interest

c) Contaminant Migration
i) Discuss factors affecting contaminant migration for the media of interest (e.g., sorption onto soils, solubility in water, movement of groundwater, etc.)
ii) Discuss modeling methods and results if applicable

7) Conceptual Site Model
8) Risk Assessment Summaries
a) Human Health Risk Assessment
i) Hazard Identification
ii) Exposure Assessment
iii) Toxicity Assessment
iv) Risk Characterization/Uncertainty Discussion
b) Ecological Risk Assessment
9) Summary and Conclusions
a) Summary
i) Nature and Extent of Contamination
ii) Fate and Transport
iii) Risk Assessment
b) Conclusions
i) Data Limitations and Recommendations for Future Work
ii) Recommended Remedial Action Objectives (RAO)
10) References
11) Tables and Figures
12) Appendices (Risk Assessments as well as logbooks, soil boring logs, test pit/trenching logs, monitoring well construction diagrams, private and public well records, analytical data, and QA/QC evaluation results)

EES will conduct the following activities to complete a Draft RI Report:

- Preparation of multiple sections of text
- Preparation of new (non-DESR) figures
- Preparation of non-analytical tables
- Updating of previous DESR figures
- Preparation and assembly of Appendices
- Three-tiered reviews of draft document
- Monthly progress conference calls for relevant EES staff during RI activities and report construction
- Special issue call(s) for relevant EES staff

Subtask 9.2 — Final RI Report

After EPA review of the Draft RI Report, EES will incorporate EPA comments and submit the Final RI Report.

Specifically, RI Report preparation includes the Draft RI Report, response to EPA (and other regulator) comments in the form of a RTC letter and Final RI Report, as well as associated contract-specified three-tiered reviews on reports. EES estimates the following LOE will be required to complete a Final RI Report:

- Revision of sections of text
- Response to EPA and regulator comments (RTC letter)
- Revision of figures

- Revision of data tables
- Three-tiered review of final document
- Monthly progress conference calls for relevant EES staff
- Special issue call(s) for relevant EES staff

TASK 10 — REMEDIAL ALTERNATIVES SCREENING

EES will develop and screen a range of remedial alternatives to address COCs associated with the Mansfield Site that pose unacceptable risks. As appropriate, pending the outcome of the risk assessments, the potential alternatives may include a range of actions such as innovative treatment technologies, proven technologies such as excavation or extraction, containment methods, limited action consisting primarily of institutional controls (IC) with little or no treatment, and a no-action alternative. EES will summarize the results in a Remedial Alternatives Screening Technical Memorandum (RAS TM). For budgeting purposes, EES assumes that **six** media of interest exist at Mansfield Site: soil, sediment, groundwater, surface water, vapor (VOCs from groundwater), and tap water (residences), and **six** media will need to be addressed in the RAS TM.

Subtask 10.1 — Technical Memorandum

As part of the FS development, EES will evaluate the RI, HHRA, and ERA report results to identify environmental media of concern and COCs on a per-medium basis, establish the basis for action, assess actionable risk, and develop the technical approach for the FS Report. The human health-based COCs will be obtained from the RAGS Table 10 series in the HHRA appendix

EES will prepare one draft RAS TM presenting the development of potential alternatives and screening results. EES will directly incorporate EPA comments on the draft RAS TM into the Draft FS Report rather than prepare a second version of the RAS TM. Specifically, in accordance with the SOW, the RAS TM will present the potential alternatives including the following information:

- Establish Remedial Action Objectives (RAOs). Based on information from the RI, HHRA, and ERA Reports, EES will identify site-specific remedial action objectives that will be developed to protect human health and the environment. The objectives will specify the contaminant(s) and media of concern, the exposure route(s) and receptor(s), and range of remedial goals for each exposure route (i.e., Preliminary Remediation Goals [PRGs]). EES assumes that PRGs will be calculated for three target cancer risk levels and one target HI (i.e., 1E-04, 1E-05, and 1E-06 and HI = 1.0) for protection of human health, and one target HI for protection of ecological receptors. EES assumes RAO development for 6 media: soil, soil gas, air, groundwater, surface water, and sediment. Human health PRG development will be conducted for these six media, and ecological PRG development for three media: soil, surface water and sediment.
- Establish General Response Actions (GRA). EES will develop GRAs for each medium of interest by defining contaminant, treatment, excavation, pumping, or other actions, singly or in combination, to satisfy RAOs. The response actions will take into account requirements for protectiveness as identified in the RAOs and the chemical and physical characteristics of the Mansfield Site. EES assumes GRA development for the above-listed 6 media.
- Identify and Screen Applicable Remedial Technologies. EES will identify and screen technologies based on the developed general response actions. Hazardous waste treatment technologies will be identified and screened to verify that only those technologies applicable to the contaminants present, their physical matrix, and other site characteristics will be considered. This screening will be based primarily on a technology's ability to effectively address the contaminants at the Mansfield Site, but will also take into account a technology's implementability and cost. EES will select representative process options, as appropriate, to carry forward into alternative development. EES will identify the need for treatability testing for those

technologies that are probable candidates for consideration during the detailed analysis. EES assumes technology screening for 6 media.

- Develop Remedial Alternatives (RA) in Accordance with NCP. The RAs will include ICs to the extent appropriate. EES assumes RA development for six media.
- Screen Remedial Alternatives for Effectiveness, Implementability, and Cost. EES will screen RAs to identify the potential technologies or process options that will be combined into media-specific alternatives. The developed alternatives will be defined with respect to size and configuration of the representative process options; time for remediation; rates of flow or treatment; spatial requirements; distances for disposal; and required permits, imposed limitations, and other factors necessary to evaluate the alternatives. If many distinct, viable options are available and developed, EES will screen the alternatives that undergo the detailed analysis to provide the most promising process options. The alternatives will be screened on a general basis with respect to their effectiveness, implementability, and cost. EES assumes RA screening for 6 media.

In addition to the activities outlined in the SOW, EES will:

- Develop estimates of areas and volumes of contaminated media for a selected risk level. EES will use RI data, GIS, and calculations based on exceedances of PRGs or regulatory criteria to assess the areas or volumes that may require remedial action.
- Prepare a preliminary identification of applicable or relevant and appropriate requirements (ARARs) in the RAS TM. EES will compile federal and state chemical-, location-, and action-specific regulations, requirements, and guidelines.

Inclusion of volume estimates and ARARs as part of the RAS TM will allow EPA the opportunity to provide input before development of the submitted Draft and Final FS Reports.

The RAS TM will include the information identified above and will follow the outline presented below:

1.0 Introduction
- Purpose and Organization of this TM
- Mansfield Site Description
- Mansfield Site History
- Nature and Extent of Contamination Summary
- Human Health Risk Assessment Summary
- Ecological Risk Assessment Summary

2.0 Development of Preliminary Remedial Objectives
- Applicable or Relevant and Appropriate Requirements
- Remedial Action Objectives
- Preliminary Remedial Goals
- Basis for Action

3.0 Identification of General Response Actions

4.0 Identification and Screening of Technologies
- Candidate Technology Identification
- Candidate Technology Screening
- Retained Candidate Technologies

5.0 Identification and Screening of Remedial Alternatives
- Alternatives Identification
- Alternatives Development
- Alternatives Screening
- Retained Alternatives

6.0 References

Preparation of the RAS TM will require the following:

- Prepare an outline
- Develop text
- Perform technical and QA reviews of the TM (i.e., text, tables, figures, Appendices)
- Develop tables and figures
- Prepare RTC letter to address EPA comments
- Format and produce TM report for submission to EPA

It should be noted that the Mansfield Site is unconventional in that the primary and secondary sources of contamination and the migration pathways are not fully defined at this time; however, it is known that (1) multiple sources appear to exist; (2) multiple media are impacted; and (3) multiple exposure pathways may need to be addressed. If the RI establishes a high degree of complexity in the numbers and types of sources, contaminants, and media for which alternatives will need to be developed and evaluated, costs presented in this work plan may need to be revised to account for the greater complexity of the FS. Examples of such situations may include numerous areas requiring remedial action, COCs other than VOCs may be present, or complex engineering considerations may exist.

EES assumes that the LOE for Task 10 - Remedial Alternatives Screening includes (1) development of RAOs, ARARs, GRAs, and PRGs, (2) determination of remedial areas and volumes, (3) identification and screening of technologies, (4) development of RAs, (5) screening of RAs, (6) generation of a RAS TM, and (7) conference calls. Specifically, report preparation includes the RAS TM, as well as a conference with EPA to discuss comments. As specified above, EES will directly incorporate EPA comments regarding the RAS TM into the Draft FS Report.

TASK 11 — REMEDIAL ALTERNATIVES EVALUATION

EES will assess each individual alternative following the evaluation procedures as in the NCP, 40 CFR Part 300; EPA's *Guidance for Conducting RI/FS under Comprehensive Environmental Response, Compensation, and Liability Act* (CERCLA) (Office of Solid Waste and Emergency Response (OSWER) Directive 9355.3-01); *Guide to Developing and Documenting Cost Estimates During the Feasibility Study* (OSWER Directive 9355.0-75) (EPA 2000b), and other pertinent OSWER guidance. The analysis will include ICs to the extent appropriate. EPA will make the final selection of the remedial alterative. Specifically, the nine criteria used to evaluate each individual alternative include:

- Overall protection of human health and the environment
- Compliance with ARARs
- Long-term effectiveness and permanence
- Reduction in toxicity, mobility, or volume through treatment
- Short-term effectiveness
- Implementability (technical and administrative)
- Cost

- State acceptance
- Community acceptance

As discussed during the June 2012 WA project initiation meeting, the FS Report will exclude the State Acceptance and Community Acceptance evaluation criteria. These two criteria will be addressed in the Responsiveness Summary that accompanies the ROD.

Subtask 11.1 — Technical Memorandum

Under this subtask, a Remedial Alternatives Evaluation Technical Memorandum (RAE TM) will be prepared to present the detailed conceptual designs, alternatives evaluations, summary tables, and detailed cost estimates for the alternatives remaining after screening (that will be presented in the RAS TM). As discussed with EPA, EES will present the evaluations in tabular form rather than narrative to streamline the RAE TM preparation.

EPA Region 2 has a Clean and Green Policy to promote strategies that reduce the environmental footprint of remediation and restoration efforts. Evaluation of green remediation practices will be integrated into the Nine Criteria Analysis. Sustainable remediation practices will be considered and integrated into the formulation of the RAs. EES will perform qualitative or quantitative (if appropriate) assessments of the environmental footprint associated with each RA as part of the evaluations.

As stated previously, four alternatives per environmental medium (for six media) will undergo the detailed evaluation process (except the "no action" alternative). Specifics regarding this evaluation process are presented below:

- Conceptual designs – Develop the process flow diagrams, prepare remedial alternative descriptions, assess mass or areas to be treated or addressed, and establish rates for treatment. EES assumes 4 alternatives for 6 media.
- Detailed evaluations – Evaluate each alternative against the threshold and balancing criteria. Estimate construction and implementation time frames. Estimate time until remedial goals are attained. EES assumes 4 alternatives for 6 media. Additionally, each alternative, with the exception of the No-Action alternative, will be evaluated for sustainability assuming use of the remaining 3 alternatives (No-action is the fourth alternative and does not necessitate a detailed evaluation for sustainability) for 6 media.
- Detailed cost estimates – Detailed capital, long-term operations and maintenance, and present-value costs will be developed for each alternative, with the exception of the No-Action alternative. Based on the conceptual designs, equipment, materials, and services will be priced. Unit pricing will be obtained from commercially available cost guides, vendor quotations, and historical remediation costs. Assumptions for estimated quantities will be developed. The detailed cost estimates will be included as an appendix to the RAE TM and the FS Report. EES assumes 3 alternatives for 6 media.
- Comparative analysis of alternatives – Each alternative will be compared with the other remedial alternatives for a specific medium. The results will be tabulated. EES assumes 4 alternatives for 6 media.
- RAE TM – Preparation of the TM will require preparation of an outline, development of text, tables, and figures, technical reviews as well as editorial and QA reviews. Additionally, EES will need to prepare an RTC letter to address EPA comments, and address formatting and production efforts.
- Conference calls to discuss the RAE TM are expected between relevant EPA and EES staff.

TASK 12 — FEASIBILITY STUDY REPORT

EES will prepare a draft and final FS Report to provide the basis for EPA's selected remedy. The FS Report will include the information developed under Tasks 10 and 11.

As noted above, regulator comments on the RAS TM and RAE TM will be addressed in the Draft FS Report. EES assumes that **four** alternatives will be included for each of the six media of concern (soil, sediment, groundwater, surface water, vapor [VOCs from groundwater], and tap water) and will be analyzed for up to one risk level (1E-04 cumulative cancer risk). In accordance with the SOW, the FS Report will include the following information:

- Executive Summary
- FS objectives
- Remedial objectives
- General response actions
- Identification and screening of remedial technologies
- Remedial alternatives descriptions
- Detailed analysis of remedial alternatives (individual and comparative)
- Summary and conclusions

EES's Level of Effort for Task 12 assumes that calculations can be made or that simple groundwater and surface water models can be used to evaluate the effectiveness of the respective alternatives, if necessary. If more complex modeling is necessary, the LOE and costs presented in the work plan may need to be revised to account for such activities.

Subtask 12.1 — Draft FS Report

EES will incorporate EPA comments for the RAS and RAE TMs in order to prepare and submit the Draft FS Report. For EES deliverables, there will be a three-tiered review of the document prior to final submission as well as overall report formatting and production. EES will also prepare and submit an RTC letter specifying how EPA comments were addressed. This RTC letter will be submitted with the Draft FS Report.

Subtask 12.2 — Final FS Report

After receipt of EPA comments on the Draft FS Report, EES will discuss, resolve, and integrate edits to prepare the Final FS Report. Internal technical and QA reviews will be performed, as well as overall report formatting and production. EES assumes that several conference calls will be required for discussions and resolutions.

TASK 13 — POST RI / FS SUPPORT

EES will provide support for the preparation of the ROD for the Mansfield Site, excluding those activities already addressed under Task 2 of this work plan.

Subtask 13.1 — FS Report Addendum

As specified in the SOW, EES will prepare a draft and final addendum to the Final FS Report based upon EPA comments, covering issues arising after the finalization of the Final FS Report.

TASK 14 — NEGOTIATION SUPPORT – Not Applicable

TASK 15 — ADMINISTRATIVE RECORD – Not Applicable

TASK 16 — WORK ASSIGNMENT CLOSEOUT

Upon notification from EPA that the technical work under the WA is complete, EES will perform necessary project closeout activities as specified in the contract. After WA closeout activities have been completed, EES will retain the WA files in accordance with contract clause H.37 – Retention and Availability of Contractor Files.

Subtask 16.1 — Revised Work Plan Budget

As part of WA closeout, EES will provide a revised work plan budget showing the actual costs incurred and its estimate to complete the closeout activities. The revised work plan budget will be submitted to EPA within 30 days of closeout direction.

Subtask 16.2 — Document Indexing

At the conclusion of this WA, EES will organize the WA files in its possession and provide the index to the PO. The index will be submitted with the long-term storage submittal required under Task 16.3. At a minimum, the index will contain the following information:

- Project name and WA number (in a heading on top of the list)
- Document date (the documents indexed will be sorted chronologically by date, beginning to end), description / subject of document, who sent the document, and who received the document.

The documents to be indexed include, but are not limited to, final deliverables, WA amendments, and working files that may need to be accessed to provide information on why certain technical decisions were made.

Subtask 16.3 — Document Retention / Conversion

EES will convert relevant paper files and major deliverables into an appropriate electronic long-term storage format (Word, Excel, and/or PDF, as applicable) and submit one copy to the EPA RPM and one copy to the EPA Records Manager, pursuant to the requirements of Clause D.l, “Electronic Submission of Deliverables.”

3.0 SCHEDULE

This work plan was prepared for WA002; EES will prepare work plan revisions if comments are received from EPA. EES anticipates that Phase I of the field investigation will begin in Spring 2013. EES anticipates that Phase I field activities will take approximately 8 months to complete and Phase II activities will commence in Spring 2014. EPA issued the initial WAF/SOW to EES on June 13, 2012, with completion scheduled for June 13, 2015.

Major deliverables and suggested submittal schedule for the RI/FS at the Mansfield Trail Dump Site are summarized in Table 3 below. The schedule for this WA is based on EES' work and sampling schedule.

TABLE 3
PROPOSED MAJOR DELIVERABLES AND SCHEDULE
FOR RI/FS ACTIVITIES AT MANSFIELD TRAIL DUMP SITE

TASK	# OF COPIES*	DUE DATE
1.2 Scoping Meeting Minutes	3**	5 days after scoping meeting
1.4 Draft RI/FS Work Plan and Budget	4**	45 days after receipt of WA/SOW
1.5 Final RI/FS Work Plan and Budget	4**	15 days after negotiation
1.7 QAPP	3	21 days after work plan approval
1.8 HASP	3	21 days after work plan approval
1.10 Meeting Minutes	3	5 days after meeting
1.13 Pathways Analysis Report	2	60 days after Phase II laboratory data are validated and in project database
2.1 Community Interview Summaries	3	30 days after receipt of direction from EPA
2.2 Draft CRP	3	30 days after receipt of direction from EPA
2.2 Final CRP	3	14 days after final comments from EPA on Draft CRP
2.4 Fact Sheets	2	3 days before public meeting/event
2.6 Public Notices	2	14 days before public meeting/event
2.8 Site Mailing List	3	14 days after approval of Final CRP
2.9 Responsiveness Summary Report	3	21 days after public meeting
5.3 Data Validation Reports	3	30 days after receipt of analytical results from laboratory
6.4 DESR	3****	45 days after last data validation report is received
7.1 Draft Baseline HHRA	3	45 days after approval of PAR, under subtask 1.13
7.1 Final Baseline HHRA	3	14 days after receipt of EPA final comments
7.2 Draft ERA	3	45 days after approval of PAR, under subtask 1.13
7.2 Final ERA	3	14 days after receipt of EPA final comments
9.1 Draft RI Report	6	60 days after approval of PAR, under subtask 1.13
9.2 Final RI Report	6	30 days after receipt of EPA comments
10.1 RAS TM	6	60 days after submission of final RI Report
11.1 RAE TM	6	30 days after approval of RAS TM, under subtask 10.1
12.1 Draft FS Report	6	45 days after approval of RAE TM, under subtask 11.1
12.2 Final FS Report	6	30 days after receipt of EPA final comments
13.1 Final Addendum to FS Report	6	21 days after receipt of EPA final comments
16.1 Revised Work Plan Budget	3**	30 days after receipt of EPA closeout direction
16.2 Document Index	3***	45 days after receipt of EPA approval on revised work plan budget, to be submitted with subtask 16.3
16.3 – Document Retention/Conversion	3***	45 days after receipt of EPA approval on revised work plan budget, to be submitted with subtask 16.2

*All deliverable copies will be submitted to the EPA RPM unless otherwise directed by EPA.
**One copy of the deliverable will be submitted to the PO and CO; the remainder will be submitted to the EPA RPM.
***One copy of the deliverable will be submitted to the EPA Records Manager; the remainder will be submitted to the EPA RPM.
****EES will also submit an electronic copy.

4.0 QUALITY CONTROL

EES's internal quality control (QC) process requires that project deliverables be reviewed to promote technical adequacy and completeness. Each deliverable for this WA will be subject to a technical and an editorial review, and EES's program manager or designee not associated with the WA will perform final QC reviews of project deliverables.

5.0 COST ESTIMATE

EES's cost estimate for the work conducted herein is specified in Work Plan – Volume 2. The Work Plan – Volume 2 is based on the EPA SOW, the kickoff meeting, discussions held with the EPA RPM, and assumptions stated in this Work Plan – Volume 1. Work Plan – Volume 2 presents SOW summaries and assumptions and the estimated total costs for the WA including tables of project costs, staffing plan, travel costs, ODCs, equipment costs, and subpool costs.

6.0 REFERENCES

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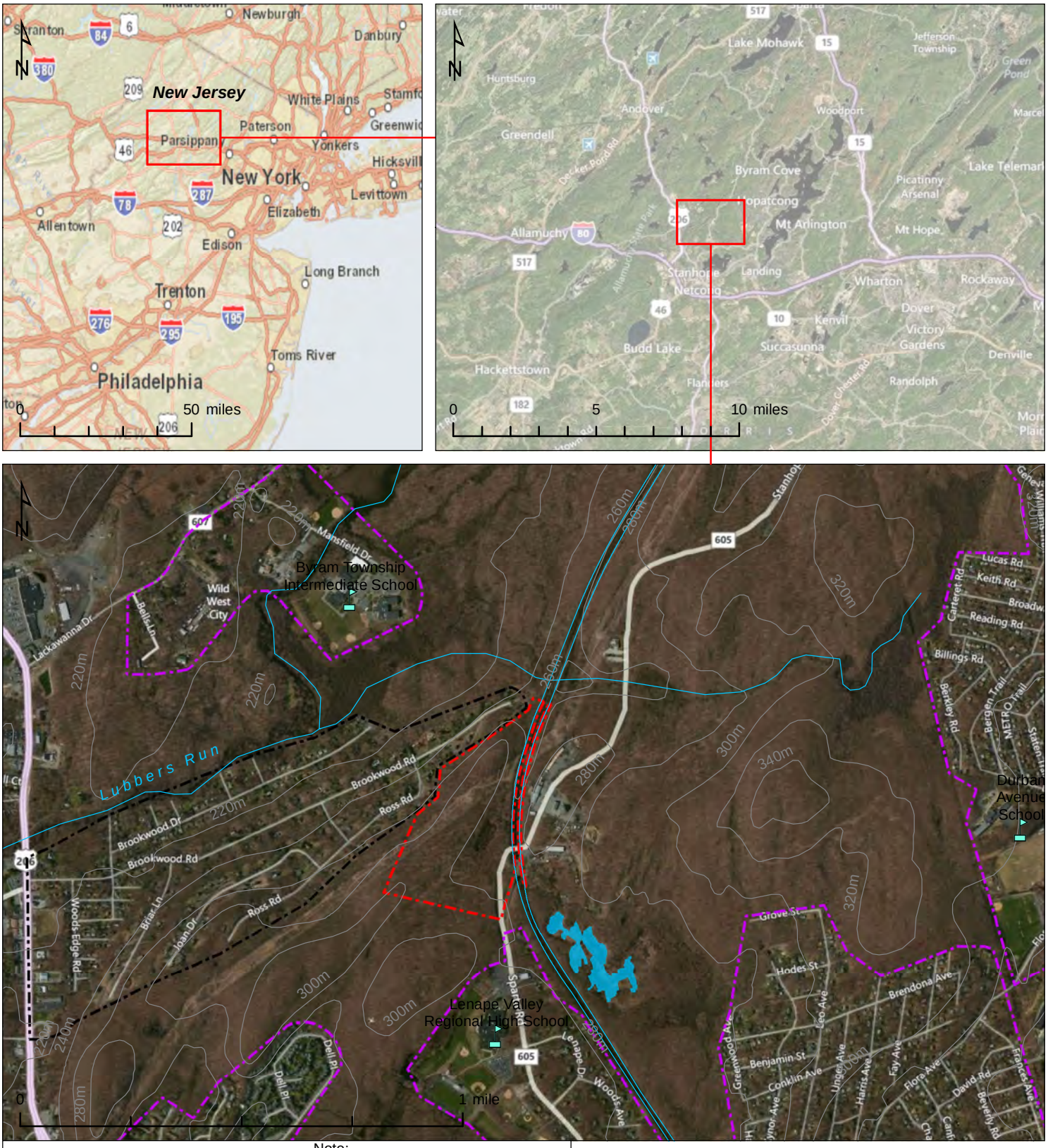
Volkert, Richard A., et al. 1989. Department of the Interior, U.S. Geological Survey (USGS). Bedrock Geologic Map of the Stanhope Quadrangle, Sussex and Morris Counties, New Jersey, GQ-1674.



School

Surface Water

Topographical contours - 20m

Source Areas Investigation Area

Residential Investigation Area

Potential Residential Investigation Area

Note:
1. Imagery Source: Bing Maps Aerial
2. Topographical data obtained from: http://www.state.nj.us/dep/njgs/geodata/dgs00-3.htm

MANSFIELD TRAIL DUMP SITE
SUSSEX COUNTY, BYRAM TOWNSHIP, NEW JERSEY

WORK PLAN - VOLUME 1

FIGURE 1

SITE LOCATION

EPA REGION 2 RAC 2 | REVISION 3 | FEBRUARY 2013

EES JV

N

Brookwood Road

Ross Road

paved bicycle path

former railroad

Dump area A (upper)

Dump area A (lower)

Dump area B

Dump area C

Dump area D

Dump area E

MW-1

MW-2

MW-3

gravel access road

high tension lines

gravel bicycle path

paved bicycle path

Sparta Stanhope Rd (605)

0 50 100 200 300 400 500 feet

1 inch = 200 feet

- Monitoring well
- Topographical Contours - 20m
- Source Areas Investigation Area
- Residential Investigation Area
- Source "Dump" Areas
- PGS&E Right-of-way
- Surface Water
- Former Railroad
- Gravel Access Road
- High Tension Line
- Paved Bike Path
- Gravel Bike Path

Notes:
1. Rights-of-way and surface bodies of water within the Source Areas Investigation Area are considered part of the Mansfield Trail Dump Site.
2. As of May 2012, source "dump" areas A, B, D, and E are excavated to to bedrock.
3. Imagery source: Bing Maps Aerial
4. Topographical data obtained from: http://www.state.nj.us/dep/njgs/geodata/dgs00-3.htm
5. References: Weston. Final Integrated Assessment Report December 2010. EPA. HRS Documentation Record. October 2010.

MANSFIELD TRAIL DUMP SITE
SUSSEX COUNTY, BYRAM TOWNSHIP, NEW JERSEY

WORK PLAN - VOLUME 1

FIGURE 2
SITE DETAIL

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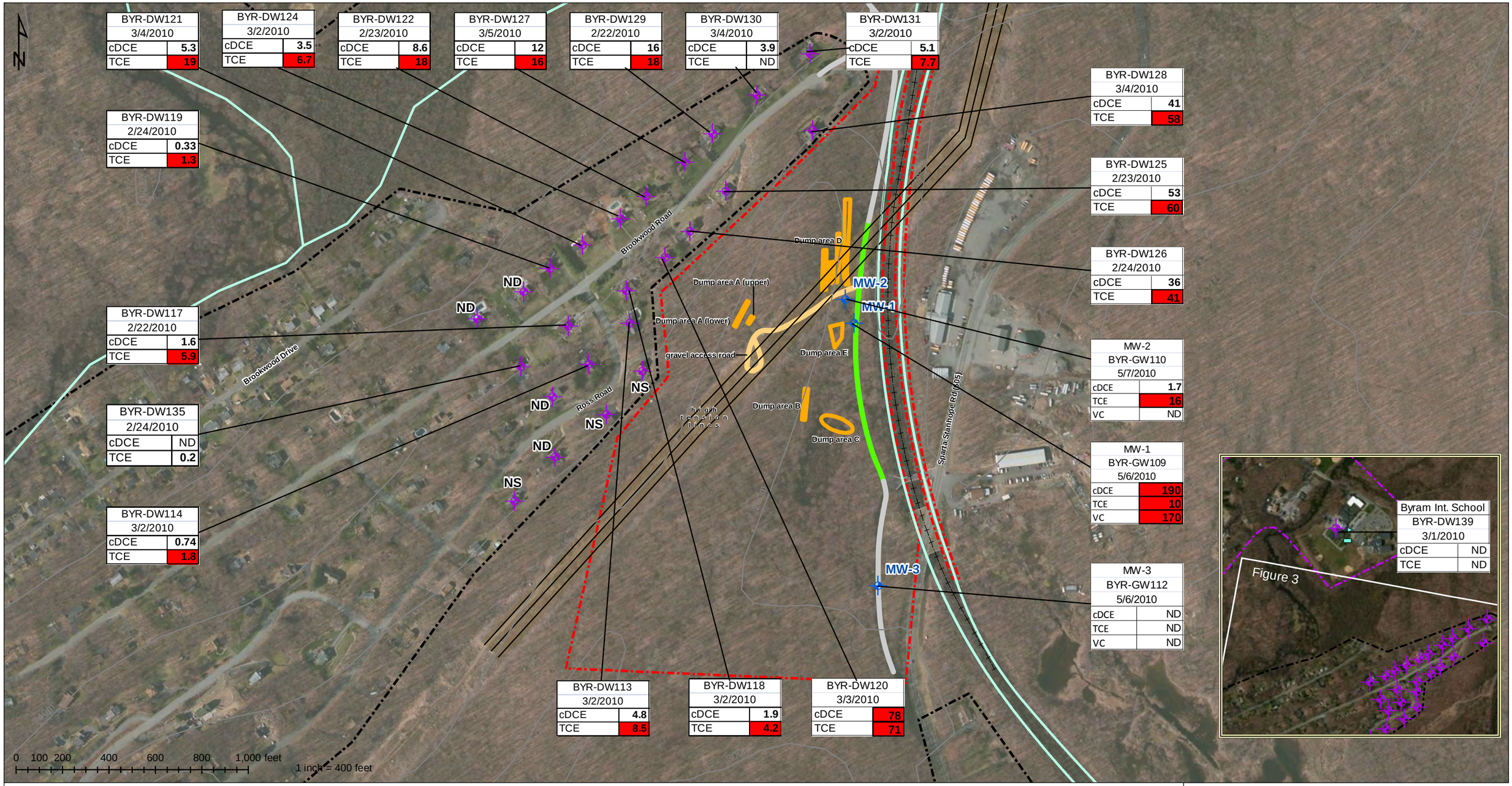

Monitoring well
Residential Sample Locations
Topographical Contours - 20m
Source Areas Investigation Area
Residential Investigation Area
Source "Dump" Areas
PGS&E Right-of-way
Surface Water
Former Railroad
Gravel Access Road
High Tension Line
Paved Bike Path
Gravel Bike Path

Screening Level		
Chemical	NJ GWQS	NJ DWS
cis-1,2-Dichloroethene	70	70
Trichloroethene	1	1
Vinyl Chloride	1	

Notes:
1. Rights-of-way and surface bodies of water within the Source Areas Investigation Area are considered part of the Mansfield Trail Dump Site.
2. As of May 2012, source "dump" areas A, B, D, and E are excavated to to bedrock.
3. Imagery source: Bing Maps Aerial
4. Topographical data obtained from: http://www.state.nj.us/dep/njgs/geodata/dgs00-3.htm
5. References: Weston. Final Integrated Assessment Report December 2010. EPA. HRS Documentation Record. October 2010.
6. Residential results compared to NJ DWS (Oct 2009)
7. Monitoring Well results compared to NJ GWQS (July 2011)
8. Bolded result indicates analytical detection
9. Red shading indicates that analyte exceeds regulatory standard (NJ DWS or NJ GWQS)
10. Results stated in µg/L

µg/L: Microgram per liter
ND: Not detected above the method detection limit
NS: Not sampled
NJ GWQS: New Jersey Groundwater Quality Standard
NJ DWS: New Jersey Drinking Water Standard
cDCE: cis-1,2-DCE
TCE: Trichloroethene
VC: Vinyl Chloride

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FIGURE 3
GROUNDWATER AND DRINKING WATER ANALYTICAL RESULTS - 2010

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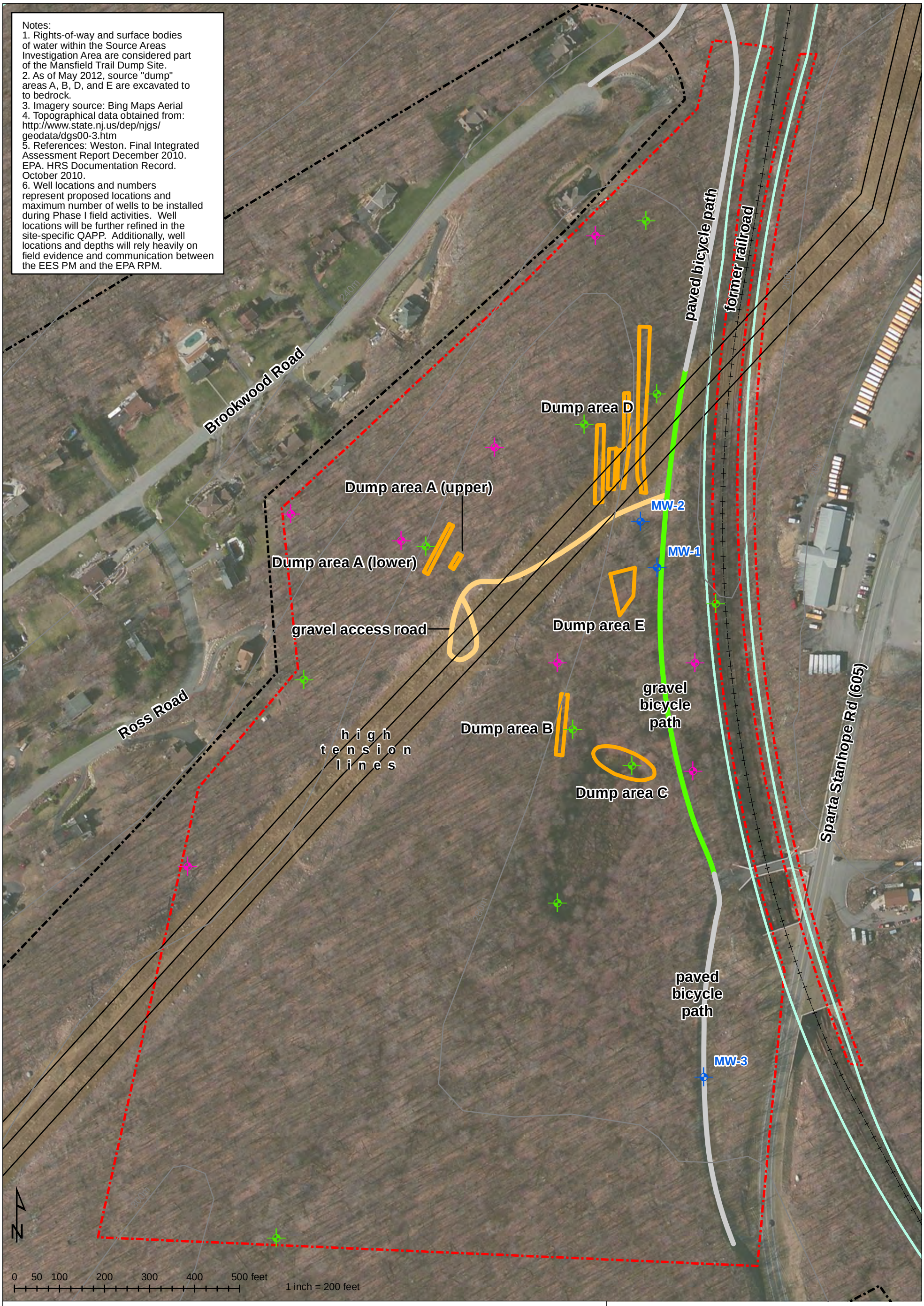
Notes:
1. Rights-of-way and surface bodies of water within the Source Areas Investigation Area are considered part of the Mansfield Trail Dump Site.
2. As of May 2012, source "dump" areas A, B, D, and E are excavated to to bedrock.
3. Imagery source: Bing Maps Aerial
4. Topographical data obtained from: http://www.state.nj.us/dep/njgs/geodata/dgs00-3.htm
5. References: Weston. Final Integrated Assessment Report December 2010. EPA. HRS Documentation Record. October 2010.
6. Well locations and numbers represent proposed locations and maximum number of wells to be installed during Phase I field activities. Well locations will be further refined in the site-specific QAPP. Additionally, well locations and depths will rely heavily on field evidence and communication between the EES PM and the EPA RPM.



- Monitoring Well
- 8 Proposed Shallow to Middle Depth Multi-level Bedrock Wells (100-400' bgs)
- 10 Proposed Overburden Monitoring Wells
- Topographical Contours - 20m
- Source Areas Investigation Area
- Residential Investigation Area
- Source "Dump" Areas
- PGS&E Right-of-way
- Surface Water
- Former Railroad
- Gravel Access Road
- High Tension Line
- Paved Bike Path
- Gravel Bike Path

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FIGURE 4
PHASE I PROPOSED OVERBURDEN AND BEDROCK WELLS

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